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THESIS

METHODS OF COST REDUCTION FOR
UNITED STATES COAST GUARD
TELEPHONE SYSTEMS

by

Russell N. Terrell

March 1981

Thesis Advisor; D. C. Boger

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Although this thesis is primarily intended for use by managers of United States Coast Guard telecommunications facilities, it is equally applicable to other government and private sector managers. Many methods of reducing the costs of telecommunications are addressed throughout the thesis. These methods are a mixture of the author's years of experience in this field as well as a collection of ideas from writings of experts in telecommunications management and interviews with current and past managers of

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telecommunications facilities. An attempt has been made to keep the presentation in layman's terms to facilitate the use of the thesis at all levels of management. To assist in understanding telecommunications terms, a glossary has been included. Additionally, a guide for Coast Guard procurement of telephone equipment has been included to assist and encourage procurement for cost savings through consolidation of facilities and introduction of new technology.

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Methods of Cost Reduction for United States Coast Guard Telephone Systems

by

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Lieutenant, United States Coast Guard
B.S., Nicholls State University, Thibodaux, La., 1975

Submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN TELECOMMUNICATIONS SYSTEMS MANAGEMENT

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ABSTRACT

Although this thesis is primarily intended for use by managers of United States Coast Guard telecommunications facilities, it is equally applicable to other government and private sector managers. Many methods of reducing the costs of telecommunications are addressed throughout the thesis. These methods are a mixture of the author's years of experience in this field as well as a collection of ideas from writings of experts in telecommunications management and interviews with current and past managers of telecommunications facilities. An attempt has been made to keep the presentation in layman's terms to facilitate the use of the thesis at all levels of management. To assist in understanding telecommunications terms, a glossary has been included. Additionally, a guide for Coast Guard procurement of telephone equipment has been included to assist and encourage procurement for cost savings through consolidation of facilities and introduction of new technology.

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Chief, Telecommunications Management Division
United States Coast Guard Headquarters

Director
GSA/ADTS Region 2

Director
GSA/ADTS Region 9

I. INTRODUCTION

The material contained in this thesis is largely a compilation of existing information which is intended primarily for the use of United States Coast Guard managers of telephone and/or telecommunications systems. The material is by no means all-encompassing; however, an attempt has been made to cover major topic areas in this management field. Several appendices are included. These may be utilized as necessary, but it is recommended that they first be referred to in reading through the thesis in order that they may be adapted to the context intended. However, Appendix A is a glossary of telecommunications terms, and as such, should be used as the need arises.

Chapter II examines the existing costs of telecommunications, both in the government as a whole and the Coast Guard more specifically. An attempt is made here to answer the question, "Why save money in telecommunications?"

Chapter III is a brief introduction to the Coast Guard's telecommunications organization, both formal and informal. This chapter is included primarily for the non-Coast Guard reader. Coast Guard personnel familiar with this organization are encouraged to skip this chapter.

Chapter IV examines several general techniques for reducing costs as well as providing a brief examination of

the policy sources in telephone management. Additionally, some tips in preparing telephone directories are included. Also, the Federal Telecommunications System (FTS) is examined with an emphasis on the expense of the system.

Chapter V looks at the reduction of transmission facility costs. More specifically, recommendations are offered in utilizing new technologies in reducing line costs. Additionally, alternatives to the telephone utilities are introduced, and their use is highly recommended. A list of these common carriers is included along with their served cities.

Chapter VI is a critical analysis of the AT&T Wide Area Telephone Service (WATS). WATS is described in detail. Information is provided to assist managers in evaluating WATS and controlling current WATS installations.

Chapter VII provides a means of reducing telephone costs through the budgetary process. Several recommendations are included to assist and encourage managers to get actively involved in the budgetary process. This is a significant method of reducing costs and should not be treated lightly. The material is somewhat simplified, but is intended as an aid to get managers started in the budgetary process and not as the means to totally master this technique of cost reduction.

Chapter VIII examines the telecommunications industry, both past, present, and future. It also provides the capstone of the thesis by briefly portraying the Coast Guard's role in the future of telecommunications.

II. JUSTIFYING COST SAVINGS

A. SCOPE

When attempting to write any material pertaining to telephone services today it is practically impossible to limit the scope to purely "telephone" matters. In reality the topic is "telecommunications". Therefore, when referring to telephone cost, this thesis is actually addressing anything of which you can receive a billing for using common carrier or commercial interconnect services. This broadens the cost considerations enormously, and brings into question the use of the term "telephone" vice "telecommunications". However, within the Coast Guard, as in other government agencies, special leased line charges are generally referred to as "telephone costs"; although, the lines may interconnect an extensive teletype or computer network. Additionally, special equipment rentals (such as conference sets), the Automatic Voice Network (AUTOVON), Automatic Secure Voice Communications (AUTOSEVOCOM), and other special circuitry and connecting hardware are often billed via TELCO billing. The treatment of these charges as telephone costs ends at the point where their interconnecting wires, conduits, coaxial cables, or optical fibers attach to a teletype, radio, computer (except computerized telephone exchanges), or other telecommunications device not directly associated with a telephone billing.

Cost reduction coverage will be limited to the following, however, some deviation may occur where special system attachments require:

1. Control of Telephone Costs

   a. Local Service Charges: These charges are for telephone lines (business, private Branch Exchange (PBX), or Control Exchange (CENTREX), terminal equipment (telephones, key systems, intercoms, speakerphones, etc...), and local message unit charges.

   b. Long-Distance Charges: These charges are for long-distance calls made on the public commercial telephone network.

   c. Leased Line Charges: These charges are for dedicated or shared lines which interconnect Coast Guard facilities (teletype lines, remote radio control lines, fog-horn control lines, light and alarm control lines, etc...).

   d. Other Charges and Credits: These charges include billing adjustments and work performed on the telephone system during the billing period (moves, connects, disconnects, etc...).

2. Management of Telephone Services

   a. Line Utilization Surveys: This is a systematic review of station lines to insure that the proper number of lines are installed.

b. Management of Station Terminal Equipment: For government agencies this is normally accomplished through a GSA required annual inventory (IAW FPMR 101-37) of all installed telephone terminal equipment. All unnecessary equipment and/or features are removed and new requirements met. This should be an ongoing effort as well as an annual inventory.

c. Selection of Station Terminal Equipment:

1. Managers should establish an office policy to provide the minimum terminal equipment to meet individual station needs and to avoid unnecessary auxiliary equipment (autodialers, speakerphones, call directors, hot lines, chimes, music on hold, etc...).
2. Station moves and system changes should be avoided as they are often prohibitive in fiscal year costs, and individual offices should be required to either budget themselves for such moves or provide timely input to telephone system managers.

The preceding defines practically all telephone costs which I will discuss, and provides some hint to managerial cost saving methods to be recommended.

B. BACKGROUND

Management of telephone costs has only recently become a major concern within the United States Coast Guard. Over the past century, the most important task of managers of these facilities was to provide sufficient voice communications to accomplish the operational mission by whatever means available. In many instances this required the development of a Coast Guard owned and maintained telephone system. However, this was the exception rather than the norm. The historical relationship between government agencies and the common carrier has been more or less a partnership [1]. The only service available to the user was that provided by the telephone company in the immediate area which in most cases was a Bell Telephone Company affiliate. This led to the engagement in cooperative provision of telephone service. The telephone companies needed the government and the government likewise. The design criterion of the telephone companies was based on the stated needs of the Coast Guard and there existed very little question of the expertise of the companies providing the service. Indeed many of these dedicated services provided since the 1940's exist today and remain adequate. Most, however, have been replaced, or are in the process of replacement. Needless to say, I am not trying to point a finger at the government or the common carriers. This relationship worked fine then, but things have changed. The seemingly innocuous "Carterfone Decision"[2]

of 1968 has dramatically altered the way telephone business is conducted today. Although government did not fully react to that decision until 1976 [3, p. 2], it has reacted. This reaction has revolutionized telephone management within the federal government, and has opened the door to phenomenal cost savings potential through the introduction of competition in this very lucrative market.

The first significant governmental reaction was the General Service Administration's (GSA) establishment of their Competitive Procurement Program [4]. GSA began defining the Federal market from a new sense of reality. This program has resulted in approximately thirty interconnected customer-provided systems as of February, 1979 [5, pp. 35-40]. Figure II-1 provides a list of these systems.

In the Coast Guard the reaction has been no less dramatic. Coast Guard owned and maintained electronic private automatic branch exchanges (EPABX) have been procured throughout the twelve Districts as replacements for older leased equipment, and even larger numbers of Coast Guard owned key systems have been procured to replace telephone company (TELCO) leased systems.

Collectively, the common carriers, government agencies, and the newly arrived interconnect industry now exist in a new federal market environment. There are many millions of dollars at stake and the competition for the government's large, small, special, and unique requirements will be turbulent to say the least.

FIGURE II-1

COMPETITIVE PROCUREMENT OF TELEPHONE SYSTEMS

LOCATION	MAIN STATIONS	CONTRACTOR	TYPE PBX	AWARD DATE	TYPE OF AWARD
Albuquerque, NM	500	Master Comm., Inc.	Northern Telecomm SL-1	9/76	Purchase
Charleston, SC	240	Southern Bell	Dimension 2000	11/76	5 yr./2 tier
Ft. Lauderdale, FL	250	First Comm. Corp.	Rolm CBX	5/77	Purchase
Juneau, AL	300	Wire Comm. Corp.	Rolm CBX	8/77	Purchase
Wilmington, NC	320	Telerent Leasing Corp.	Rolm CBX	9/77	Purchase
Bridgeport, CT	300	Int. Bus. Tel., Inc.	Rolm CBX	11/77	5 yr. lease
Homewood, IL	150	DIDCO, Inc.	OKI Discovery 3	11/77	Purchase
Anchorage, AL	2150	Anchorage Telephone Utility	Northern Telecomm SL-1	2/78	Lease
Port Authur, TX	100	Communities Corp. of America	Northern Telecomm SL-1	2/78	Purchase
West New Orleans, LA	450	Fisk Comm. Corp.	Rolm CBX	2/78	Lease
Charlotte, NC	400	Telerent Leasing	Rolm CBX	3/78	Purchase
Hammond, IN	200	Livingston Comm.	Northern Telecomm SL-1	5/78	Lease/Purchase
Floyd Bennentt Field, Brooklyn, NY	150	Teletronics, Inc.	Ericson ARD 562	5/78	Purchase

LOCATION	MAIN STATIONS	CONTRACTOR	TYPE PBX	AWARD DATE	TYPE OF AWARD
Pocatello, ID	100	Mountain States Tel & Tel Co.	Dimension 400	6/78	Lease
New Castle, DEL	70	Diamond State Tel	CENTREX CO	7/78	Lease
Gary, IND	200	Livingston Comm., Inc.	Northern Telecomm SL-1	8/78	Lease/Purchase
Olean, NY	50	United Telecomm	Rolm CBX	8/78	Purchase
Johnstown, PA	300	General Telephone Co. of PA	CENTREX CO	8/78	Lease
Mandam, ND	60	Executone	Executon	9/78	Lease
West Los Angeles, CA	1000	COMPATH, Inc.	Rolm LCBX	11/78	Purchase
Lansing-East, Lansing, MICH	500	Michigan Bell Telephone Co.	CENTREX CO	11/78	Lease
Waterloo, Iowa	24	Northwestern Bell Telephone Co.	711 PBX	12/78	Lease
Farmington, NM	50	Bomur Telephone Interconnect Co.	NEAX 12	12/78	Purchase
San Angelo, TX	38	General Telephone Co. of the Southwest	Rolm CBX	12/78	Lease
Amarillo, TX	450	Communications Corp. of Am. A-1	Northern Telecomm SL-1	12/78	Purchase

LOCATION	MAIN STATIONS	CONTRACTOR	TYPE PBX	AWARD DATE	TYPE OF AWARD
Carbondale, ILL	60	General Telephone Co. of Illinois	FOCUS II CBX	1/79	Lease
Madison, WI	775	Wisconsin Telephone Co.	CENTREX CO	2/79	Lease
White Plains, NY	200	GTE	GTE-1000	3/79	Purchase
Laramie, WY	60	Mountain Bell	Dimension 400	2/79	Lease

Source: Frank J. Carr, "Government Telecommunications Needs for Civilian Agencies", Telecommunications, June, 1979, p. 37.

To imply that this was strictly the result of the "Carterfone Decision" is certainly naive. There were many decisions which followed. In order to provide a summary of these major developments without diverting at great length from my topic, Appendix B is included which summarized these events [6, pp. 351-356]. This chronology begins in 1962 with a series of approximately thirty decisions, all of which contributed to the rapid growth and extreme changes within the telecommunications industry.

C. BUDGETARY IMPLICATIONS

Telecommunications usage in the federal government has been increasing tremendously over the past decade. This increase can be attributed to direct support of new and expanding federal programs. Various agencies within the federal government have demonstrated through budgetary savings that good management and effective use of information technology, such as voice communications, can assist in increasing productivity and mission performance without increasing the size of the federal budget or work force [7].

The Coast Guard, because of its small size and vast mission responsibilities is in a situation where the above increase in productivity and performance has been more or less forced upon the organization. Although requirements have steadily increased, the budget for telecommunications support has lagged. As a result more efficient use of current resources has become vital.

Currently, annual obligations for voice telecommunications equipment and services by executive agencies exceed six hundred million dollars ($600,000,000). Telephone billing costs amount to two-hundred and sixty million dollars ($260,000,000) annually, with a growth rate averaging twelve percent (12%) per year [8, p. 1]. This represents over forty percent (40%) of all Federal voice telecommunications costs. In the Coast Guard alone telephone service and equipment costs are increasing at approximately one million dollars ($1,000,000) per year (10% per annum) without an obvious increase in support for mission performance [9]. The Chief of Operations for the Coast Guard has stated the following:

> "In order to retain the independent management authority for our telecommunications resources, we must demonstrate our ability to manage them, thereby, ensuring support for out operations." [10]

Figure II-2 provides a breakdown of the costs of Coast Guard telephone service projected through 1981 using the actual 1978 and partial 1979 data. This representation provides the "why" in cost savings for the Coast Guard and this thesis.

The chapters that follow deal with the problem of reducing the overall costs involved in the use of telecommunications services within the federal government.

FIGURE II-2

UNITED STATES COAST GUARD TELEPHONE COSTS

	1978	1979 (EST)	1980 (EST)	1981 (EST)
Total Agency Personnel	44,819	45,326	45,593	45,636
Total Agency Telephones	18,819	19,263	19,834	20,280
Average Number of Personnel/Telephone	2,40	2,35	2.29	2.25
Total Obligations				
a. Local Service Charges (recurring and non-recurring)	4,233,064	4,257,540	4,682,849	4,789,889
b. Commercial Toll Charges	1,632,868	1,821,807	2,058,934	2,228,854
c. Intercity Charges (FTS)	4,517,133	5,034,347	5,496,141	6,045,746
d. Total	10,383,065	11,113,694	12,237,924	13,064,489
Average Cost/Telephone	556	577	617	644

Source: United States Coast Guard Voice Telecommunications Management Report. Dated 7 September 1979.

III. COAST GUARD TELECOMMUNICATIONS ORGANIZATION

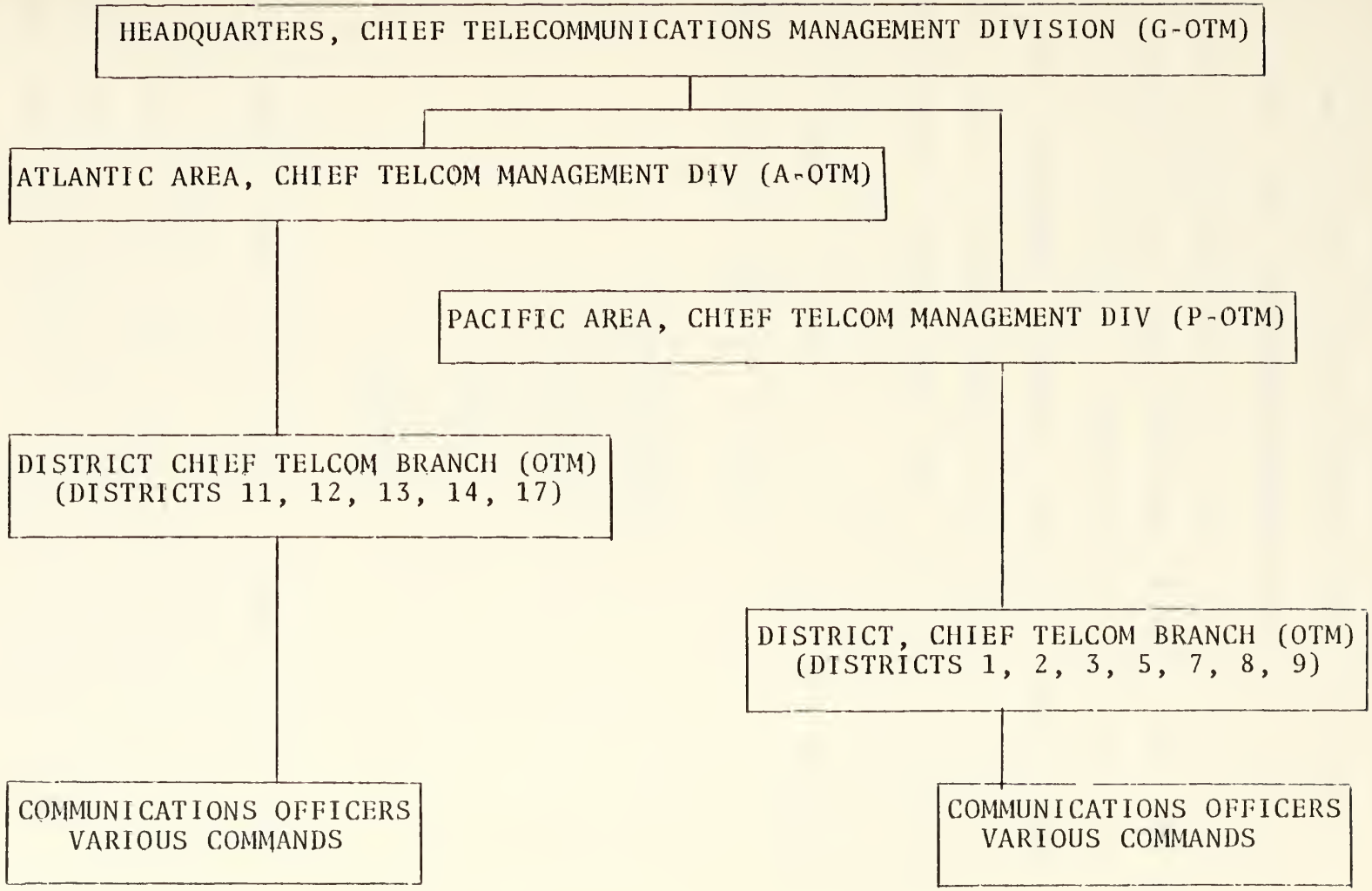
A. CHAIN OF COMMAND

Management of Coast Guard telecommunications follows the hierarchal structure shown in Figure III-1. This particular chain of command is strictly an administrative one for the management of telecommunications services and facilities.

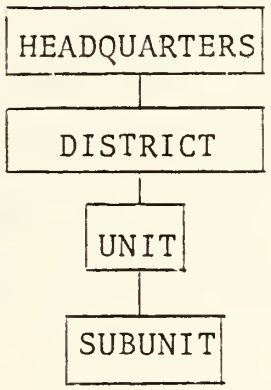
In general, Coast Guard telecommunications is managed from the top down through a pyramidal arrangement. The Headquarters Chief, Telecommunications Management Division is responsible for the proper planning, organization, operation, inspection, supervision, and coordination of all communications within the Coast Guard [11, p. 3-1]. The pyramid then branches into two area commands, Atlantic and Pacific. Their duties can be defined in much the same manner for their respective areas, as can District Chiefs of Telecommunications Branches for their districts. It is at the district level where the meat of the "hands-on" management begins. Below this level are the many units which accomplish the myriad of tasks required of the Coast Guard. It is the district manager's responsibility to see that each command has the telecommunications facilities available to accomplish these tasks.

In reality, the area commands play very little role in the management of telephone costs within the Coast Guard and

FIGURE III-1


HEADQUARTERS, CHIEF TELECOMMUNICATIONS MANAGEMENT DIVISION (G-OTM)
ATLANTIC AREA, CHIEF TELCOM MANAGEMENT DIV (A-OTM)
PACIFIC AREA, CHIEF TELCOM MANAGEMENT DIV (P-OTM)
DISTRICT CHIEF TELCOM BRANCH (OTM) (DISTRICTS 11, 12, 13, 14, 17)
DISTRICT, CHIEF TELCOM BRANCH (OTM) (DISTRICTS 1, 2, 3, 5, 7, 8, 9)
COMMUNICATIONS OFFICERS VARIOUS COMMANDS
COMMUNICATIONS OFFICERS VARIOUS COMMANDS

even then only a role of managing immediate command local toll and service charges. Their major concern is long distance communications which cross district boundaries (mainly radio). The telecommunications services they utilize are provided and managed by their host District (Pacific Area shares Twelfth District facilities and Atlantic Area shares Third District Facilities). Additionally, when questions arise or new equipment is desired, District Branch Chiefs need not consult the Area Command unless they are directly involved because of their long range facilities (Communications Stations, Radio Stations or the Automated Mutual Vessel Assistance Center). Therefore for the purpose of managing telephone costs the chain is actually:



All requests involving telephone systems follow this chain. Many requests, however, never reach the top because of the existing policy which emphasizes delegation of authority and funding/cost control responsibility to the district and unit level for intra-district telephone services [12]. This

policy forces the user of the service to bear the cost. The intention of this is to ensure economic use of resources and to allow district and unit commanders flexibility in applying resources to accomplish assigned missions. The downhill flow through the chain normally goes the full route. Current headquarters management provides some flexibility and, if district managers find fault in headquarters telecommunications policy or direction, changes can be implemented from the bottom up. This is especially true in cost saving methodology pertaining to telephone expenses.

B. BELOW THE DISTRICT LEVEL

There is a tremendous variety of types of units which comprise a district. Generally there are several independent commands which may be comprised of over one-thousand employees or as few as one or two. The functions of these commands are not material to this thesis and hopefully their titles will provide sufficient discriptive information.* The following is a brief list of types of Coast Guard commands:

Training Center
Support Center
Industrial Base
Marine Inspection Office (MIO)
Marine Safety Office (MSO)
Group Office
Small Boat Station
Captain of the Port

---

* For additional information see: DOT Pub. 0-252-237: The U.S. Coast Guard: It's Missions and Objectives.

Loran Station
Lighthouse/Light Station
Air Station
Recruiting Office
Boating Safety Team
Electronics Shops
Research and Development Center
Communications Station
Radio Station
Ships (another huge category)

This list does not cover all type commands. However, without going into the details of the service organization, it does provide an idea of the variety of needs and terrains to be dealt with in telecommunications management.

One other point of interest in the telecommunications organization is the role of the group office. There are usually three to seven groups under a district. Each group has its own communications officer who works closely with the district manager. He is responsible for the telecommunication services within his group, which is comprised of several smaller commands (Lightstations, Small Boat Station, etc...). The management ability of this individual can be an excellent asset to the district manager or the lack of ability may create a hinderance. Therefore, here alone is one of the most important items in cost savings. It is imperative that the group communications officer have sufficient training to manage the facilities he has available. This is the direct responsibility of the Group Commander. However, each district manager should assume this responsibility and provide the requisite training to make district management

easier. This is also true for other commands with assigned communications officers, such as large ships, marine inspection offices, and support centers.

IV. GENERAL SAVINGS TECHNIQUES

A. TELEPHONE MANAGEMENT POLICY

In order to have effective management of telephone systems and related costs, functional policy guidelines must be established. To be functional this policy should be promulgated from the highest practicable staff level. In carrying out this policy, managers should be able to speak and act with the authority of this individual and with his full support. Without this support, telephone system managers often find their hands tied in activities such as toll abuse and new equipment acquisitions. It is necessary to keep this individual appraised of all significant changes or problems which arise within the system. If you have his authority it is probably best to keep him over-informed until he establishes his own "need-to-know".

At the headquarters level, telephone management policy is established by the Chief, Office of Operations, in the Coast Guard Telecommunications Manual (Commandant Instruction M2000.3). This policy guidance is applicable to the entire Coast Guard and is enforced by the Chief, Telecommunications Management Division, his staff, Atlantic and Pacific Area Telecommunications staffs, and the twelve District Telecommunications Branches.

In addition to this policy guidance, each District establishes two aids to telephone managers. Both carry the authority of the District Commander. The first is the Communications Plan Annex to the District Operations Plan. The second is the District telephone directory. The Communications Plan often parrots the Telecommunications Manual, however, it is also used to delineate specifics within a particular district. If there is significant policy which a manager wishes to have established, the Communications Plan is the most effective place. An example of this would be having all authority pertaining to managing the district telephone system delegated in writing in the Communications Plan. If spelled out properly, this could provide a "free hand" for the system manager and his staff.

The telephone directory should be a policy guide directed to users of the telephone system. As such, it should provide the user with all the information necessary to utilize all assets of the system available to him. It should also provide users with the rules within which they must operate in using the system.

The final echelon of policy guidance is the unit telephone directory and the unit operation plan. These two guides are generally similar in nature to the district equivalents, and both carry the authority of the unit commanding officer. They set forth policy specific to the unit. All violations of this policy are answerable to the commanding officer.

In general the above policy guidance covers the following:

1. Assignment or Delegation of responsibility for management.
2. Staffing requirements.
3. Definitions.
4. Lease vs purchase information.
5. Administrative control and services to be rendered.
6. Networks attached to a specific system.
7. Special system availabilities.
8. Credit cards.
9. Choice of telephone facilities.
10. Pay stations.
11. Directory listings and changes.
12. Procurement and change of service.
13. Required records.
14. Telephone usage.
15. Submission of telephone bills.
16. Repairs.
17. Classified matters.
18. Personal call prohibitions.
19. System features and their access.
20. Collect calls.
21. Third party calls.
22. General Services Administration requirements.
23. Budgetary matters.

There are many more items which may be included on this list. However, those listed can all be found in one of the previously noted policy sources.

The most important point of emphasis in this section is that all the policy guidance in existence has no value without the support of top management. Therefore, every effort should be exercised in obtaining and maintaining this support.

B. TELEPHONE DIRECTORIES

Good telephone directories save dollars. More simply stated, time in any organization represents cash flow. If personnel time is wasted, regardless of the activity, money is lost through poor utilization of staff time. This is seldom a tangible loss of funds. However, it is an easily recognized loss in effectiveness.

Very little specific policy guidance exists to help districts or units establish effective directories. However, each district has spent literally decades polishing the ones they currently use. The example of these various directories provides excellent guidance for districts and unit to establist their own directories in the absence of strict policy. As such, there is sufficient flexibility to maky any changes to existing directories, utilize portions of other districts' directories, or totally adopt the format of a particular district. The basic premise of this thesis is that Coast Guard directories, at present, are effective. There are,

however, some additional recommendations:

1. Directory lettering should be reduced as mush as possible and still be easily read. This reduces printing costs significantly.
2. All directories should contain a concise table of contents.
3. Telephone instructions should be as brief as possible to encourage user reading, but of sufficient length to provide instructions on all feature and network (FTS, AUTOVON, WATS, etc.,.).
4. Personal calls should be strictly forbidden and emphasis placed on this statement. Personnel should be advised that violations may result in prosecution under Articles 92 and/or 134 of the Uniform Code of Military Justice (UCMJ).
5. Third party calls should also be strictly forbidden (item 4. above applies).
6. Commercial toll calls should be strongly discouraged and some means of control established.
7. The issuance of credit cards should be prohibited in the general directory and their actual issue highly controlled for intelligence agents, oil pollution response personnel, and other staff authorized by seperate authority.
8. Augment the directory with quick reference listings or matrices on front, rear, and inside covers of the directory.

9. Review other district and/or unit directoreis and adapt any time saving features which are not in the directory used by your command.
10. Consult with the local telephone utility on directory establishment. Often they have people who specialize in this aspect of telephone work and will provide assistance in establishing directories or analyze existing ones at no charge.
11. Discourage the use of personnel listings. This is often a needless reproduction of the local telephone directory, and, besides being impossible to keep them up-to-date, they are expensive to have printed.
12. If the Commanding Officer insists on personnel listings, incorporate them within the unit listing and reduce the print drastically to minimize page counts.
13. Do not list individual home numbers that are not in the local commercial telephone book without the persons permission. This is a violation of the Privacy Act [13].

In reviewing the various district directories it is difficult to select one which uses all of the above recommendations. The directory established by the First Coast Guard District, however, appears to be representative of most. Again, it should be emphasized that all district directories should be reviewed at each new printing to ascertain which changes should

be incorporated. The First District directory is exemplary of one which has used the time saving methods of several other directories and can easily be used as a model to assist new developments. A copy of this directory may be acquired by writing:

Commander (OC)
First Coast Guard District
150 Causeway Street
Boston, MA 02114

C. TOLL CALLS AND MESSAGE UNITS

Despite efforts to cut cost, most districts and many units continue to run up heavy tolls. Many of these charges are for official business calls within the GSA's fifty cent ($.50) exclusionary zone (calls within a $.50 area of a serving GSA PABX are required to be dialed over the commercial network as opposed to the Federal Telephone System (FTS)). Others are official toll calls made because FTS, WATS, AUTOVON, or other special access systems were busy. Quite often many toll calls are the result of user ignorance. Too many people do not read their telephone system instructions or they do not understand them and refuse to ask the appropriate office for assistance. Two other sources of high toll costs are "hold button hangers" and long-winded talkers. "Hold button hangers" tie key equipment up on 3,000 mile commercial calls while they wait for someone to return from coffee. The long-winded talkers need 45 minutes to complete a 5 minute call. Very few of the total

toll and message unit costs can be attributed to deliberate abuse via personal long distance calls. However, those which are can easily be traced by the telephone company at the unit's request, and it is very seldom that these abusers are not caught. As soon as one or two of them face nonjudicial punishment most of this abuse will end.

To eliminate these unnecessary costs, it is necessary to hold periodic seminars on the use of the unit telephone system. All new staff should be required to attend, and any offices targeted as heavy abusers or high toll recipients should also be present. In these seminars it should be stressed that any call within the United States may be called over the FTS. No one can use the excuse, "The place I was calling didn't have FTS". There are sufficient instructions in the FTS users guide to make calls within the contiguous states, Hawaii, and Alaska. Also, units having access to AUTOVON can proceed in much the same manner. However, AUTOVON has better overseas access. Units having access to Wide Area Telephone Service (WATS) have special problems. These are addressed in Chapter VI.

If it is necessary to make commercial calls they should be made directly without operator assistance. If at all possible, toll calls should be made during the AT&T discount times (5PM-11PM, 40% discount from daytime service; 11PM-8AM, 75% discount from daytime service). Callers on the West coast can come to work a little earlier and on the East coast

stay a little later. The irony of this is the FTS is generally available at these times, and, although it is actually more expensive to the government as a whole to utilize the FTS at these times, it is cheaper for the unit.

Any staff member who makes frequent calls from home should be given the FTS off-net access code to enable them to make official calls from non-FTS phones. Instructions for these calls are contained in the FTS users guide.

Besides the above, there are other tools available to the manager to control toll costs. Selective restriction is available to units who have their own Private Automatic Branch Exchange (PABX) or are served by a telephone company Centrex. All phones which are only necessary for calls within your system can be totally restricted to this use. The telephone company charges a one time installation charge for this service. If your system has multilevel access (dial 9 for commercial, 8 for FTS, 117 for WATS, etc...) you can use selective restriction to allow any combination of availability to any line or phone.

Toll-diverting equipment is effective in reducing costs where operators are used. Individuals dialing "9" are automatically diverted to an operator who screens the calls. Unauthorized callers seldom have the nerve to ask the operator to place a personal call.

A very effective method of toll control is the use of least-cost routing equipment. This is commercially available

equipment which selects the least-cost route for every call made through a PABX or Centrex having this capability. This is especially useful in systems having multilevel access. The big plus to this capability is the reduced training required. All an individual needs to know is the telephone number he is dialing. The equipment selects FTS, WATS, AUTOVON, Commercial, or other routes available. When incorporated with an automatic accounting system (Telephone Accounting and Routing System, TARS), you "build-in" management and eliminate the need for training, via software. This makes system management and usage much simpler.

TARS equipment varies greatly in cost and features. However, the basic TARS package consists of:

1. Optimum facility routing.
2. Call queuing.
3. Toll call restriction.
4. Individual call accounting.

As a minimum TARS' collects data consisting of the number that placed a call, number dialed, date and time the call was placed, duration, and type of line used [14, pp. 14-16]. Some TARS which are actively involved in placing calls perform functions such as restricting certain individuals or stations from making calls, controlling the time of day calls can be made, and controlling which areas of the country may be called. Such systems are generally computerized and programmable. Some modern electronic private automatic branch exchanges

(EPABX) incorporate TARS functions or offer them as add-on features. This should be considered in any new acquisition of aPABX or an EPABX. Some companies offering TARS are listed below;

1. Account-A-Call Corporation
   4450 Lakeside Drive
   Burbank, California 91505
   (213) 846-3340

2. Alston Division of Conrac Corporation
   1724 South Mountain Avenue
   Ouarte, California 91010
   (213) 357-2121

3. AT&T
   Contact local TELCON

4. BITEK International Corporation
   3200 East 29th Street
   Long Beach, California 90806
   (213) 426-5927

5. COM DEV
   P. O. Drawer 5336
   Sarasota, Florida 33579
   (813) 758-6494

6. Communications Group Incorporated
   443 South Gaulth Road
   King of Prussia, Pennsylvania 19406
   (215) 265-6615

7. DANRAY Incorporated
   1201 East Arapaho
   Richradson, Texas 75081
   (214) 234-7500

8. DATAPOINT Corporation
   9725 Datapoint Drive
   San Antonio, Texas 78284

9. ITT Communications Systems
   60 Washington Street
   Hartford, Connecticut 06106
   (203) 549-1800

10. ROLM Corporation
4900 Old Ironsides Drive
Santa Clara, California 95050
(408) 988-2900

Another important aspect of toll cost control is expediting calls. If you are ever in doubt about the accuracy of a number you are calling never call it. Instead, dial the commercial area code plus 555-1212. This is a free long distance information operator. The operator will give you the number. If the call is made over the commercial network, immediately state that the call is "long distance" to the answering party. When the person you want gets on the line, introduce yourself fully to avoid time consuming call screening. If the person you are calling is on another line, courteously ask the secretary to put a note on his desk indicating that you are waiting on "long distance" and ask if he will be long. If he intends on talking a long time leave instructions for him to call you. Above all, know ahead of time what you intend to say when placing a long distance call. Organize your thinking, say what you want, get any information you need and cordially say "good-bye". Save personal "chit-chat" for personal time. Remember, you would not want your congressman's aide talking to his Harvard classmate burning your tax dollars, and he surely would feel the same about you. This is a hard point to convey to system users. They all want to be courteous to their friends

and strangers as well, but managers must continually remind all users of the tremendous cost involved and the importance of expediting all calls.

The above items apply equally to areas where message units are charged on local calls. Message units and toll calls can also be reduced by using foreign exchange (FX) lines. If there are an extensive number of calls from your system to a particular area code for long distance calls, or a particular exchange in a message unit area, a line can be leased at a flat rate from your system to a Centrex in the other area code or exchange which will make that area or exchange appear as though it is within your local system. This can greatly reduce both toll and message unit charges. However, managers should make certain that all calls on these lines are restricted to either the area code or exchange accessed by the FX service. If not, individuals gaining access to the FX lines may extend calls anywhere in the world from the Centrex at the foreign end.

Another valuable method of reducing message unit charges is through the use of tie lines and off-premise extensions (OPX). If units within different message unit areas often call each other, their PABXs or Centrex may be tied together for a monthly mileage charge plus an inexpensive monthly termination charge. This can also be accomplished by having an extension of one system connect to the other. Either way, this technique provides twenty-four hour, seven days a week

message-unit free calling, and the QPX or tie lines will also allow both users access to each other's features.

D. FTS: NOT A FREE SERVICE

The Federal Telecommunications System (FTS) is the federal employee's link to other government agencies and every commercial telephone in the fifty states and Puerto Rico. FTS began in 1963 as an effort to provide continunity of government operations during emergencies and reduce the cost of day-to-day telecommunications requirements. The system is now the largest private-line telecommunications network in the country [15]. It incorporates over a million miles of circuitry. In 1978, the FTS handled approximately 200 million long distance telephone calls at an average cost of eighty-nine cents ($.89). This resulted in a savings of over one-hundred and ninty million dollars ($190,000,000) in one year [16].

Although the FTS is primarily a telephone network, it also includes computer and data terminals for data transmission as well as facsimile. The system is administered by the Automated Data and Telecommunications Service (ADTS) of the General Services Administration (GSA). Instructions for the use of the system are contained in the FTS users guide, available from your local GSA/ADTS representative.

The prime advantage in establishing a common use system is economics. It is more economical than having many diverse

systems. The economies of scale include direct dialing, bulk procurement of circuitry, more effective use of circuits through a switched system, and consolidation of switchboards. Financial transactions encountered in the FTS are kept in a revolving fund. System costs are apportioned among agencies using the FTS on a reimbursable basis to the fund. Since agencies are billed at a flat rate many users feel system costs are fixed. Therefore, there is a great deal of abuse on the system. In actuality, agency usage is sampled by the GSA at a twenty percent (20%) sampling rate. The actual message length is the sampling unit. The total estimate for billing is tabulated and sent to the agency (Department of Transportation, DOT, for the Coast Guard). The agency then separates the billing into its divisional organizations.

Based on the sample usage provided to the Coast Guard by the GSA, the Coast Guard pays a large portion of the DOT billing. The Coast Guard FTS intercity billing was three million eight hundred thousand dollars ($3,800,000) in fiscal year 1977; in excess of four million dollars ($4,000,000) in fiscal year 1978; and in excess of four million and five hundred thousand dollars ($4,500,000) in 1979 [17]. GSA indicates Coast Guard usage is increasing at a constant rate. This implies that the billing will increase proportionately.

In view of the preceding explanation of the FTS, it is recommended that all telecommunications managers treat the FTS in much the same manner as the commercial telephone

service when training personnel in the use of the system. Additionally, cost reduction concepts covered in sections B and C of this chapter should be applied to the FTS as well as the commercial toll service.

E. EQUIPMENT COSTS

There are few methods of reducing the costs of telephone equipment. Unfortunately those charges are a necessary part of total system configuration. However, managers have two options available to them. They can either reduce the amount of equipment or consolidate existing equipment.

1. Equipment Reduction

The reduction of leased line costs is discussed in Chapter V. Besides line charges, there are other costs which deserve the attention of the cost conscious manager. Key telephones are one of the most significant contributors in this area. Too often multiline key telephones are sitting on desks of individuals who really do not even need a single line. Whether this is status or the result of office reconfiguration does not really matter. Every Coast Guard telephone manager should conduct periodic equipment usage surveys to determine where reduction is needed. Assistance in accomplishing this survey is available from the regional GSA/ADTS office. They will either provide staff training or active assistance. Remember, each light, relay, line, and active button on a key telephone has a related charge. Managers

should insure that they are all necessary. Additionally, many key systems have intercommunication (Intercomms) capability. If these intercomms are not used, or only one or two stations use them, they should be removed. There are less expensive intercomms available for two person use which can be purchased cheaply and do not incur monthly costs.

If a key system is served off of an EPABX or Centrex, features available negate their need. Single line telephones with tone dialing, rather than rotary dialing, should be utilized to access features which allow multiline pick-up, hold, consultation hold, conferencing, etc..., without the high cost of key equipment.* Usually this technique offers sizeable savings, but each particular situation must be analyzed carefully to insure a savings.

Another rule for government managers is "do not allow gadgetry". Occasionally managers are confronted with individuals who want, and often get, special frills attached to their telephones. This should be discouraged. If such items exist when a manager arrives at a new location, a good practice is to wait until the individual is transferred (if military) and remove the frills. If the employee is going to remain for an extended period of time you may need the support of top management when confronting the individual. If top

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* For more information on this technique consult your local TELCO account representative or GSA Regional ADTS representative.

management is the abuser, it is necessary to be tactful and explain that executive status is not excess telephone equipment but as little telephone equipment as possible. If this ploy does not work, perhaps you can explain that top management should provide example. Tact is the answer in these efforts.

Sometimes telephone switchboards exist where simple key systems would suffice. Small Coast Guard stations are all too often in this situation. Any case where even a remote suspicion of this possibility exists should be examined thoroughly. If this is the case a lease versus buy study should be examined. More often than not, a key system can be purchased with a very short pay-back period. Even if it is determined that a switchboard or PABX is justified, a lease versus buy study should be accomplished. You may find that a PABX or an EPABX can be purchased at a tremendous savings. The procedures for accomplishing these tasks are included in Appendix C. It is important that managers do not overlook or avoid these possibilities. The long-term savings available may be significant in curbing the increasing telephone budget.

2. Consolidation

The best means of consolidating equipment was addressed in the preceding subsection 1. Key equipment, although often used incorrectly, can consolidate many users on few lines. If purchased, only the lines incur chages. Also, a

PABX accomplishes the same task, only many more users are involved. When a PABX is purchased, again you pay only line charges.

The use of extensions is another means of consolidation. If individuals need telephones but have low utilization they should share lines with other low use staff. This is in addition to key station extensions. Personnel identified with low utilization do not necessarily need to be on key equipment. They can have a single line extension just as well, or even possibly share a set with another desk.

Line consolidation is another factor. Chapter V addresses this concept at length.

V. REDUCTION OF TRANSMISSION FACILITY COSTS

A. INTRODUCTION

In the early days of telephone usage each conversation required a pair of wires to complete the electrical circuit. Today's technology has evolved to the point where many methods exist which allow the connection of one user to another. The two wire (twisted pair) still exists and is widely used. Other methods of facilitating connection are coaxial cable, microwave, satellite, and optical fiber. When completing a call, a user may be utilizing any one or all of these technologies to connect to the opposite end user.

In the Coast Guard, when using these facilities to interconnect owned equipments, such as teletypes, fog horn controls, remote radio equipment, fire and intrusion systems, vessel traffic monitor cameras, navigational beacons, and other remote equipment, we commonly refer to the charges as "leased line charges". In the case of microwave charges, they are called by the correct name, but budgeted for with leased line charges. Appendix E is a collection of schematic drawings depicting the leased lines which are used throughout the Coast Guard for telecommunications of record traffic. Although this shows an extrodinary amount of circuits, it does not include the enormous number of remote radio control, Aids to Navigation, security, and alarm circuits which are located throughout

the twelve Districts. Collectively, the cost of these leased circuits is tremendous. The cost of these facilities to any one district is a significant portion of their total telecommunications budget. Unfortunately, in reviewing these transmission facilities very little innovation or attempts to reduce costs are evident. Practically all of these services are provided by either the local telephone companies or AT&T Longlines via a pair of wires. This area of telephone related charges offers one of the greatest opportunities to District Telecommunications Managers for instituting large savings. These savings can be achieved by using newer technology and through selection of alternate interconnect carriers who are in competition with the common carriers and who are not restricted by the existing tariff arrangements.

B. NEW TECHNOLOGY

The use of coaxial cable, microwave, satellite, or optical fiber technologies as individual methods of cost reduction is fine. However, it is usually the case of using them in conjunction with one another along with polling, multiplexing, and other techniques which results in most new system designs. The actual concept which I recommend is "elimination and consolidation". Managers should conduct an intensive review of all leased line facilities to determine locations where multiple connections exist and eliminate all circuits which are unnecessary and consolidate the others.

In the Third District such a review took place in 1977. A Coast Guard Reserve Officer and a Third Class Telephone Technician (TT3) worked for six weeks compiling a list of these circuits and the TT3 located and tested the actual wiring. This alone resulted in significant savings, because there were numerous alarm circuits, including a multi-location air raid alarm, which either did not exist or had been inoperable for some time. All of these circuits were eliminated. In one location there were several circuits going from a Life Boat Station to one of its remote unmanned facilities located adjacent to a twenty-four hour manned Park Service building. There were approximately twelve pairs of wire, each representing a separate leased cost. Several of the lines were associated with a fire and intrusion alarm system. By the time individuals could drive the two miles to respond to a fire it would have been too late, and intrusion was highly unlikely. All lines except those controlling a radio beacon at the location were eliminated. However, if there had been opposition to the removal of these circuits this would have been a prime candidate for multiplexing.

1. Multiplexing

Multiplexing is essentially the sharing of a transmission line by dividing the usable bandwidth of the facility into two or more channels through either splitting the frequency into narrower bands (frequency division multiplexing, FDM), or by allotting the common channel by time, (time

division multiplexing, TDM) [18, p. 249].* In a situation where several lines are leased to provide connectivity between one unit and another it may prove economical to purchase or lease multiplexing equipment in order that the lines may be consolidated into a single transmission line. For instance, a Group Office may have a Small Boat Station located twenty to thirty miles away. The station may have two or more off-premise extensions (OPS) from the Group's switchboard. It could have both high frequency (HF) and very high Frequency (VHF) radios remoted to the Group, and perhaps other circuits as well. This is at least six dedicated lines with individual charges. Figure V-1 illustrates this arrangement in block form and also shows a multiplexed alternative. The multiplexing capability may not be within the ability of the serving telephone utility. However, there are often companies other than the telephone company who can provide this service, at equivalent or lower costs. Some of these will be discussed in Section V.B.

2. Polling

Another technology which is already in wide use in the Coast Guard is polling. In a District such as the Third where there is a large system of teletypes interconnected and consolidated at a single location, polling is essential. Here

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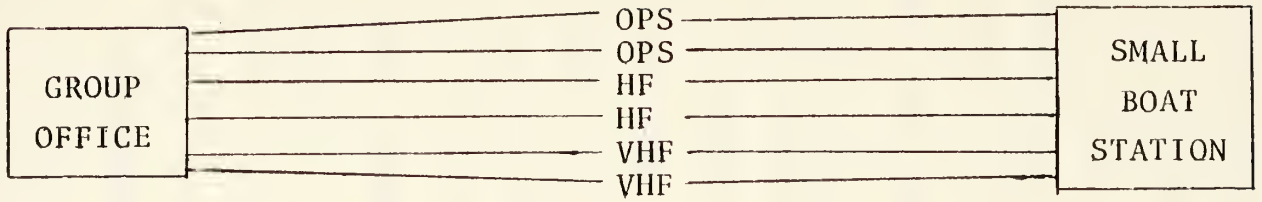
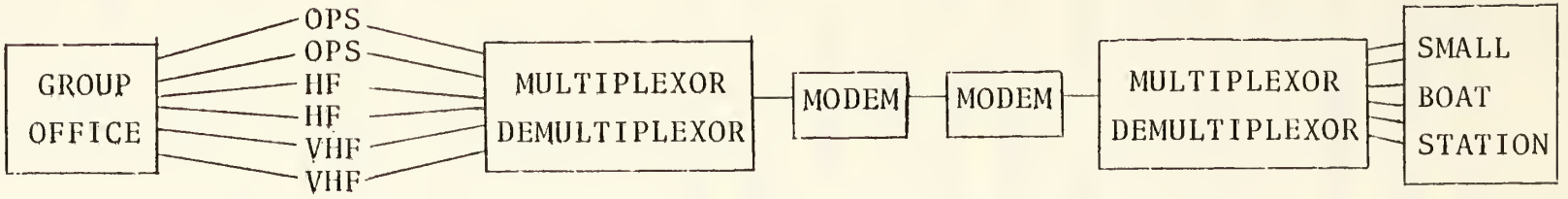
* If further information is desired on the engineering or design aspects see references 6, 18, or 19.

FIGURE V-1

WITHOUT MULTIPLEXING



WITH MULTIPLEXING



NOTE: The actual connection between Group and Station is on a single line pair. The Multiplexor/Demultiplexors and MODEMS are located at the two commands in the telephone equipment area.

the savings is again in the consolidation of many users on a single circuit (see Appendix E, CCGDTHREE, 83B3). The polling provides a means of controlling the communications lines connecting the many users of the circuit. The communications control device will send signals to a terminal saying, "Terminal A. Have you anything to send?" If not, "Terminal B. Have you anything to send?" and so on. It provides a time saving alternative to contention (busy signals), and it makes sure no terminal is kept waiting for long periods. Polling is also automatic and user terminals are allowed to remain unmanned during polling functions. This frees individuals for more productive activities. The polling signal is usually sent under a program control within the polling unit (a computer in actuality). The program will have in memory a list for each channel which determines the sequence of polling. High users can be programmed more than once in each cycle to avoid any excess waiting [19, pp. 123-139].

My main purpose in addressing polling is to make it known to nonusers and to encourage its use. However, even though most of the units in use today are old, newer systems are available using minicomputer technology which is more versatile. The Semiautomated Message Processing System (SAMPS) now in use in several Districts is a prime example. It has freed billets through control functions which perform message relay within communications centers. It is felt that this system can be extended to perform polling functions and it is

further recommended that this extension be encouraged. The system add-ons may be cost prohibitive, but in lieu of the aging 83B3 systems this avenue should be further explored if SAMPS is to be operated for an extended period. If not, it is hoped that full system automation, ie., the total consolidation of communications center functions into a computer control system, will be a long range goal.

3. Facsimile (FAX)

This is not a new technology, but it has come a long way since its beginning. The transmission of images is rapidly becoming a speedy means of getting information from one point to another. It has been in wide use in the Coast Guard for a long time, and the use of FAX will continue to grow in this organization. In fact FAX is another possibility for saving money. There are numerous commands throughout the Coast Guard which have dedicated teletype circuits and receive only occasional traffic. The costs of these dedicated leased lines are often over two hundred dollars per month. The need for continuing to pay for this dedicated service, commercial telephone service, and the Federal Telephone System (FTS) for a single low utilization command is questionable. Small FAX machines such as EXXON's QWIP/FAX can be purchased at approximately the same cost as two to four months of leased line charges. These machines have a two minute page transmission time and when used with the FTS incur no appreciable expense. There is an almost unlimited variety of FAX machines available.

Some are faster and others slower, and many can be operated in an unattended mode. The main objection to using FAX comes from District Communications Center personnel who are generally too rushed to take the time to use FAX machines. However, quite often the objections are merely excuses. Messages to units who would use FAX as their primary means of hard copy traffic could be sent during slack time or, if units are unattended, during the early hours of the morning. Quite often, however, the traffic can be sent to a Group Office from the District Communications Center via rapid means and the FAX can be located at the Group. It is below the Group level that the under-utilized leased lines are usually found. Units subordinate to Groups do not have trained teletype operators, so that Groups normally have to reprepare and format traffic coming from subordinate commands. With FAX, the subordinate command sends a properly released message in a typed or handwritten form over telephone lines to the Group where the message is formatted and forwarded by rapid means. If the FAX operation is a burden on the communications personnel, it is a function easily accomplished by any clerical or administrative employee. Additionally, at Groups with EPABX facilities conference calls can be established easily allowing FAX transmission to several locations at once.

Another example concerns units such as Aids-to-Navigation Teams, Boating Safety Teams, and Recruiting Offices. These units often come under a particular office within a

District Staff. The clerical personnel at both ends could provide the service necessary to operate FAX machines and traffic destined for delivery to the units could be determined by the program office in the District unless specifically addressed to the unit, in which case they would be required to send the message to the addressed unit. It would be the responsibility of the cognizant office to insure that the District Communications Center routed all necessary traffic to him for delivery to the outlying unit.

All of this may sound a bit complicated, but it is not. It can be very simply accomplished at considerable long range savings with minimal initial investment. Similar arrangements are in use in the Third and Nineth Districts, and are proven systems.

C. ALTERNATIVES TO TELCO

The 1970 Specialized Common Carrier (SCC) Decision by the Federal Communications Commission (FCC) allowed firms other than AT&T to begin offering common carrier service [20]. The original FCC decision, and subsequent court rulings always dealt with the authority of the SCC's to supply private line or tie-line service (see Appendix B for specific decisions). However, the SCC's charters have been expanded to include switched services such as Microwave Communications Inc.'s (MCI) "Execunet". These services provide direct distance dialing service between all of those cities in which SCC's have facilities.

SCC's can be categorized by the type of transmission methods used for carrying their traffic. The SCC's formed in the mid 1970's all use microwave links as the backbone of their long distance circuits. There are three major national terrestrial specialized common carriers in the United States. The oldest and best known is MCI. As noted in Appendix B, it was MCI who forced the 1970 decision which created the SCC industry. Since then MCI has continued its fight to protect and expand the rights of SCC's. This continuous pressure has allowed them to expand and flourish [21]. This will be discussed further in Chapter 8.

Southern Pacific Communications (SPC) is the common carrier subsidiary of the Southern Pacific Railroad. SPC offers the same services as MCI. However, where MCI is nationwide SPC is primarily a Western States company.

The U.S. Transmission System, Inc. (USTS) is a subsidiary of ITT. USTS is a fairly new service, however, it is anticipated that it will offer the same range of services as MCI, and SPC. USTS is primarily an Eastcoast company as is the fourth SCC, XEROX. XEROX has entered the SCC realm rather accidentally through interconnection of its vast corporation. Nonetheless it plans to offer a wide range of service in the near future [22].

The other category of SCC's consists of those carriers which offer satellite circuitry. The few satellite SCC's that exist have been formed since 1975. The growth and

expansion of these carriers has been severely hampered by the scarcity of satellite earth stations in this country. Presently satellite carriers offer only private line service. There are two major corporations in existence, RCA American Communications and American Satellite Corporation (a subsidiary of Fairchild Industries) which also offer domestic satellite communications services.

These SCC's may be able to help Coast Guard managers reduce their dependence on local TELCO's and AT&T Longlines. In hopes that consideration will be given to this alternative Tables V-1, V-2, V-3, and V-4 have been included, which provide cities served by these carriers, with the exception of XEROX.

TABLE V-1

CITIES SERVED BY MCI

Akron	Detroit	Phoenix
Atlanta	Fort Worth	Pittsburgh
Austin	Houston	St. Louis
Baltimore	Kansas City	San Antonio
Beaumont	Los Angeles	San Francisco
Chicago	Minnisota-St. Paul	South Bend
Cincinnati	Newark	Toledo
Cleveland	New York	Tucson
Dallas	Oklahoma City	Tulsa
Dayton	Omaha	Washington, D.C.
Denver	Philadelphia	Wilmington, Del.

TABLE V-2

CITIES SERVED BY SPC

Albany	Hartford	Pittsburgh
Anaheim	Houston	Providence
Atlanta	Indianapolis	Sacramento
Baltimore	Jersey City	St. Louis
Boston	Kansas City	San Antonio
Chicago	Los Angeles	San Diego
Cleveland	New York	San Francisco
Dallas	Oakland	Tucson
Detroit	Oklahoma City	Tulsa
Fort Worth	Philadelphia	Washington, D.C.
	Phoenix	

TABLE V-3

CITIES SERVED BY USTS

Allentown
Atlanta
Baltimore
Baton Rouge
Birmingham
Charlotte
Greensboro
Harrisburg
Houston
Lancaster
Lynchburg
Newark
New Orleans
New York
Norfolk
Philadelphia
Richmond
Spartanburg
Stanford
Washington, D.C.
Wilkes Barre

TABLE V-4

CITIES SERVED BY RCA AMERICAN COMMUNICATIONS

Chicago	Philadelphia
Dallas	New York
Houston	San Francisco
Los Angeles	Washington, D.C.

CITIES SERVED BY AMERICAN SATELLITE

Atlanta	New York
Chicago	San Francisco
Dallas	Seattle
Houston	Washington, D.C.
Los Angeles	

VI. WIDE AREA TELEPHONE SERVICE (WATS)

A. NO PANACEA

Because of the growing interest in WATS within the Coast Guard it is necessary that all managers and users understand exactly what WATS is and how it should be used. Like the Federal Telephone System (FTS) and the Automatic Voice Network (AUTOVON) it is an expensive service and one very easily abused. Frank Greisinger, one of the nation's foremost telephone system consultants stated the following in an article for Administrative Management [23]:

> "Personal calls multiply with the addition of WATS because users realize that a particular call is buried in the mass of calls. In our actual client experience, we have found that as much as thirty percent of dial access WATS traffic is personal."

The above experience is not limited to private sector. In interviewing managers of WATS services at military commands the author received similar responses. The telephone system manager for the U.S. Army Seventh Infantry at Fort Ord, California noted that he had experienced difficulty in controlling WATS costs, but had managed to secure call detailing information on WATS usage. With this information he was able to identify abusers and regain control. This information is not readily available from the telephone company. Although the telephone company will generally have the detailed calling data on magnetic tape or other means, it is not required to

provide this data to the user because WATS is a flat rate service. However, it may provide the magnetic tapes, if requested to do so, and the user can print his own data. This is how Fort Ord obtains their information as does the Seventh Signal Command at Fort Ritchie, Maryland.

Fort Ritchie, as the Headquarters for the Seventh Signal Command, attempted to assist their subordinant commands in managing WATS through promulgation of a Telephone Systems Optimization Program (TSOP) in 1974. Their hope was to reduce overall costs. However, the following is an excerpt from a recent letter to all commands from Fort Ritchie:

> "WATS is used to provide commercial calling capability, at reduced rates. WATS calls are not free. The most important consideration in managing the calls is to treat them as toll calls since they cost nearly as much. The ideal control of WATS is where all calls are certified the same as toll calls. The Army cannot continue to accept the implementation of cost saving/cost reduction programs that result in cost increases due to the lack of support of some unconcerned units or activities. It is the responsibility of commanders at all levels to insure that WATS remains a cost-effective alternative to commercial toll service." [24]

This letter again exemplifies a common problem experienced by the Army.

The manager of the telephone system at the Naval Postgraduate School, Monterey, California, informed the author that he was also having severe problems with WATS. Unfortunately, he does not receive the detailed calling information from the telephone company; neither has the command made any effort to secure call detailing equipment for management purposes; nor

has there been an economic analysis to see if it would be feasible to purchase such equipment. To amplify the significance of his problem further the following quotation from one of their tenant commands' instructions is included:

> "As a result of an analysis of NPS and tenant command telephone usage, WATS was implemented in August 1976 in an attempt to reduce the cost of long distance calls. Unfortunately, the popularity of WATS and the lack of an effective means to control usage have generated significant overtime charges and costs well above the usual long distance bills experienced before WATS implementation." [25]

The point here is obvious. Managers must be absolutely sure that the need exists to install WATS. Once installed, users must be continually educated in the proper use and informed of the extraordinary expenses associated. Additionally, managers must be able to gain access to call detail information (get this in writing from the TELCO before installation), and be able to determine the type of WATS needed. Above all, it is important to remember that AT&T is anxious to sell all users WATS. The telephone utilities have found that once WATS is installed, total revenue from the combined use of the service and long distance usually goes up [26]. The preceding examples bear witness to this fact. Therefore, view the implementation of WATS carefully, and manage WATS seriously and efficiently.

B. DESCRIPTIVE INFORMATION

WATS is a bulk rate plan which allows customers to make multiple calls into or out of a particular location for

established monthly rates. Full business day WATS provides for two-hundred and forty hours per month calling at a fixed rate. Measured-time WATS establishes a minimum ten-hour usage period for a fixed price, with each additional time being charged on a per hour basis. Interstate WATS is restricted to calls made between points in different states. Intrastate WATS must be used between calling points within the state.

The interstate WATS Tariff partitions the country into five progressively larger bands or territories which can crudely be described as concentric circles with their common center at the WATS location. The Band 1 region generally includes all adjacent states and the Band 5 region includes all forty-eight contiguous states. Bands are organized so the region associated with a particular WATS band includes all geographic area associated with lower numbered bands. For example, Band 3 includes Bands 1 and 2, etc...

It can be determined from tariffed rate information that when monthly measured time usage gets close to fifty hours, the breakeven point for full business day WATS service is approached [27]. Alternatively, users can establish their own method for making this determination.

The U.S. Army has established a formula for calculating the "cross-over" point between measured time (MT) and full business day (FBD) WATS (24). This is the method recommended by the author for Coast Guard applications in

determining the cost at which it is more economical to change from MT to FBD. The formula is as follows:

$$\text{CROSS-OVER POINT} = \frac{\text{(FBD initial cost)} - \text{(MT initial cost)}}{\text{HOURLY RATE}} + 10$$

For example, a user in Arizona subscribes to a MT Band 5 WATS. The MT initial charge is $258 for ten hours. Each additional hour is charged at the rate of $19.32. The FBD initial cost is $1,761 for 240 hours. Therefore:

$$\frac{\text{FBD} - \text{MT}}{\text{HR}} + 10$$

$$\frac{\$1,761 - \$258}{\$19.32/\text{hr.}} = \frac{\$1,503}{\$19.32} = 77.8 \text{ hours}$$

ADD 10 (hours covered by the initial cost of MT)

77.8 hours + 10 hours = 87.8 hours

If usage is more than 87.8 hours, the user is better off with FBD. This application assumes no common cross-over point (as alluded to previously). It requires recalculation for each WATS band at every location under the existing tariff structure.

AT&T has no obligation to inform a measured time customer that full business day service would possible be more economical or to convert. These planning and control activities are strictly up to the user. Additionally, a WATS line provides only one line into or out of a service location and if undesirable busy signals cannot be tolerated, multiple lines may be required. Each line will be subject to individual WATS charges.

From a purely technical standpoint, WATS is identical to the service obtained using the direct distance dialing (DDD) network on a "pay-as-you-go" basis. Any allegations that WATS has different data transmission properties than regular long distance service is technically erroneous. WATS lines use the same switched facilities of the DDD network. The only plausible difference between the services is the rate structures for this usage of the public telephone network.

C. INSTALLING WATS

There is only one way to determine if WATS will save you money. You must divide your total toll calls into WATS bands and then compare the cost of WATS for those bands with the toll cost. In doing this manually, each toll call can be placed in a column for its corresponding WATS band (develop a matrix). The serving telephone utility will provide you the area codes applicable for WATS bands from your location.

This comparison may be done over a period of weeks or months. At any rate, it is very labor intensive. Another more viable alternative would be to inform your local telephone company business office of your interest in acquiring WATS. They will put a marketing representative in touch with you. He will in turn provide you with a WATS study. This study will be a computer printout which will analyze all long distance calls. A typical analysis will give you summarized information on the following calls:

1. Calls to points in your own state.
2. Calls to interstate WATS Bands 1, 2, 3, 4, and 5.
3. Credit card calls.
4. Third-number calls.
5. Overseas calls.
6. Incoming collect calls.

The information provided may vary depending on the serving telephone utility. However, you will usually learn:

1. The number of calls made into each WATS band.
2. Total toll cost per WATS band.
3. The total number of minutes of chargeable time for each WATS band.
4. The number of 100 call-seconds (one minute and forty seconds) for each WATS band. These will be used by the telephone company in calculating the number of WATS bands recommended.
5. The official telephone company recommendation.

In analyzing this data you must be careful to allow for the overflow of long distance calls from WATS into toll. This overflow is always present because users who constantly find WATS busy will seek alternatives. In general, costs for toll should be one-hundred and twenty-five percent (125%) of WATS before you even consider installing WATS, and one-hundred and fifty percent (150%) is a much safer figure [28, p. 31].

If this recommendation of an analysis technique appears oversimplified, managers may consult other techniques found in the texts of the attached bibliography, or elsewhere. However, the contention here is that the decision to acquire WATS, or the determination of its need is rather simple. The difficulty with WATS is management after acquisition.

D. ANALYZING AND CONTROLLING CURRENT WATS INSTALLATION

WATS costs can be controlled by managers through utilization of AIOD (Automatic Identification of Outward Dialed calls) equipment, Centrex WATS accounting information, applying simple telephone management techniques, or by educating personnel.

AIOD equipment is offered for purchase or lease by several different companies in the interconnect industry as well as many telephone utilities. The cost of AIOD hardware has decreased due to innovations in minicomputer technology. Although, there is a large disparity between costs

of present systems. Therefore, before acquiring a particular system, it is best to shop around. Any large user of WATS should contrast his use of WATS without AIOD with a comparable installation with the system. It should be readily apparent that a savings will be seen. The deciding factor will nearly always be the cost of the AIOD equipment.

The simpliest and least expensive AIOD equipment traces a dialed call back to the originating telephone station. Thus, separate information can be furnished for each numbered telephone line in a telephone system (behind a PABX or CENTREX). The information usually supplied is:

1. Station number.
2. Date of call.
3. Digits dialed.
4. Circuit over which call was routed, time of connection.
5. Time of termination.
6. Length of call.

Since all calls are recorded on magnetic tape, the user can also get data on calls subject to message unit charges. The tape can be removed at intervals convenient to the telephone managers accounting procedures. More expensive systems will provide greater detail. However, this is usually a software determinant for the specific AIOD selection made.

CENTREX users in certain states, can secure inexpensive WATS accounting information which will trace WATS calls to the originating station. This information is provided by the

telephone utility using equipment furnished by them in conjunction with their electronic switching system (ESS) central offices. For users in areas which offer this service with CENTREX it is recommended that it be acquired when installing WATS, and if WATS is in use presently with a CENTREX offering this service it should be purchased. Minimal economic analysis will more than likely show an extremely short payoff period.

Other valuable methods of controlling WATS costs are listed below. These items appeared in the September-October 1976 issue of the Business Communications Review [29], and, as a minimum, should be incorporated in any Coast Guard WATS installation.

1. If calls can be delayed when calling from the Central or Pacific time zones until after 5 P.M. it will save thirty-five percent (35%) of daytime long distance cost. If special working arrangements can be established to concentrate Western calling from the Eastern time zone in after 5 P.M. hours, WATS usage may be materially decreased.
2. If Central and Pacific zone people can get to work early, dialing Eastern zone offices before 8 A.M., and making sure the dialed number is answered in the East before 8 A.M., Central or Pacific time, it will save sixty percent (60%). Also, conversations may continue all day at the discount rate. This five

minute call is far less expensive than the call placed on a properly loaded FBD WATS lines.

3. Unless a manager can justify over ten hours usage of a specific WATS line, do not install it. WATS overtime is discounted, but be sure you know the number of hours you must use before WATS becomes less expensive than a long distance call of similar length. The second and succeeding minutes of interstate long distance calls likewise carry a substantial discount.
4. Never permit usage of a ten-hour MT/WATS circuit after 5 P.M., Monday thru Friday, and do not permit it to be used at all on weekends. The discounted off-peak long distance rates are always less expensive.
5. If you have considerable traffic between your office and another office, investigate the full-time and measured-time services of the specialized common carriers. If much of your total long distance traffic is point-to-point conversation between specific offices, WATS may be far more expensive than installation of tie line circuits.

VII. SAVINGS THROUGH THE BUDGETARY PROCESS

A. MONEY TO THE USER

Perhaps one of the most effective savings techniques utilized in several of the Coast Guard Districts is accomplished through budgeting. The technique consists of simply providing funds to the users of telephone services. This sounds obvious, but surprisingly several districts do not allow all of their subordinant units to manage their own telephone expense. A source in the Comptroller's office of one of these districts stated that:

> "By limiting the distribution of funds there are fewer errors in accounting, it is easier to keep track of point account managers, there are fewer hands in the pot, the Comptroller can be easily shown where district dollars reside, and overall funds management is made simple through consolidated management of the master budget."

To a comptroller in charge of several million dollars, this would sound perfectly feasible. However, it is an easy escape route. This methodology eliminates many savings possibilities in rental costs. Some of these in particular are telephone charges, GSA vehicle rental charges, copy machine rentals, and word processing equipment rentals. In the system above, the billing does generally go to the user. The user certifies the usage as official and sends the bill to the account manager. The account manager reduces his point account by the appropriate amount and routes the bill to the

Voucher Section of the Accounting Branch. There the bill enters the Comptrollers accounting system for entry on the master account. This provides no incentive for cost reduction.

The system proposed here is already in use either partially or entirely in some districts. "I can vouch for the success achieved within the Third Coast Guard District because I was directly involved as the communications account manager during the evolution. In an article written for the Coast Guard Telecommunications Bulletin I recounted this evolution [30, pp. 11-13]." As a sample of the success which occurred in another district, the following quote is included from a former Chief of Communications in the Seventeenth District"

> "After eleven years in communications including four as Chief, Communications Branch, Seventeenth District, I am convinced that the only way to reduce telephone costs is to return all telephone dollars to the unit level. Let the Commanding Officer or Officer-In-Charge determine whether he should buy paint or make telephone calls. Then provide sufficient information concerning cost saving techniques to the units so they may search out cost reduction alternatives using the District Communications Office as consultants." [31]

In a system which works in the above manner the units include their telephone needs and other rental needs in their annual unit operating budget. These estimates are reviewed by the Communications Branch for accuracy and either raised, lowered, or forwarded approved to the Comptrollers Budget and Review Branch. These estimates are then included in the individual unit accounts and deducted from the former

major district account. Since the unit accounts existed previously there is not significant added burden to anyone except the Voucher and General Ledger Sections of the Accounting Branch. Billings will now be received from many more locations and problems which were previously addressed to the major account manager may now be fielded by clerical workers. However, this need not be the case.

B. RELATIONSHIP WITH THE ACCOUNTING BRANCH

If accomplished according to my recommendation, the move to lower level billing will not incur significant problems within the Accounting Branch of the Comptroller's Division. It should in fact provide the Comptroller valuable funds savings and an excellent opportunity for quality assurance. The savings, as addressed previously, accrue from the user managing his own expense within a predetermined budget. As the manager of all District Communications, it is the responsibility of the Communications Branch to review this budget for accuracy, to insure that units can cover all expenses, to assist units in acquiring additional funding during the fiscal year, and to reduce budgets which are inflated.

In the Third District, the Assistant Chief Communications Branch accomplishes these tasks. After unit budget submission a consolidated units budget is put together by the Budget Review Branch for review by the various program managers. This consolidation, which contains all unit requests for telecommunications support, is reviewed by the Assistant. He reviews each

budget seperately, comparing to previous years and adding a predetermined inflation factor to aid in determining if the request is acceptable. He also considers any systems changes which are scheduled for the units and may adjust the budget request accordingly (purchase of an owned key system, reductions or additions of equipment, the closing of the unit for seasonal or maintenance reasons, etc...). Upon completion of the review a consolidated budget change recommendation is sent to the Budget Review Branch where the reductions and additions are entered on the units budget. This is generally the approved budget which the units must live with and the Assistant Communicator must police. This policing requires that he have some mechanism for periodically checking unit bills. He must become a frequent visitor to the Accounting Branch. He will have to establish a working relationship with their staff to aid them in establishing new accounts, and gathering bills from units which are reluctant to send them to the District (either approved as official business or just sending them in at all). He will also have to assist them in making adjustments to erroneous billings, and probably most important, he should establish a total unit audit within the Accounting Branch to provide the Comptroller a valuable quality assurance tool.

The audit conducted by the author was semiannual. Every unit was reviewed to insure that all bills were received by Accounting and to insure that the units were within their

budgets. If a unit was over budget, copies of bills were made and investigated further after the audit. If there was an acceptable reason, the unit was assisted in acquiring additional funds. If not, the abuse was reported to superiors and action was taken to correct the problems. If units demonstrated significant savings, the Comptroller was requested to allow them a chance to use the savings for unit improvements, morale, or operational needs. This was usually approved unless funds were drastically needed elsewhere for operational reasons. If errors were found in the accounting mechanics, they were noted, and corrections requested.

This methodology worked outstandingly. Everyone involved benefitted and large savings were made. Evenutally, perhaps a similiar turn of events will take place Coast Guard wide. The success, however, depends on the dedication of the people involved, in particular, the communicators. Often we overlook financial management as one of the most important aspects of our work because we work in a technical environment.

C. GSA COOPERATION

One problem which may be encountered in establishing unit billing is obtaining the cooperation of the General Service Administration (GSA). If this occurs it is best to try to work with the Region or Regions with which you receive service from at the District level. GSA is very cost conscious and is normally willing to assist in any way to help reduce costs.

Many Coast Guard units receive their entire service from the GSA and never receive a bill. Instead a master billing is sent to one or more units for certification and accounting. It is imperative that the change to individual billing be articulated to the head of the Automated Data and Telecommunications Service Division within the serving Region, and in such a manner as to stress the savings possibilities. This request will most certainly receive objection from the GSA accounting staff. However, it will probably be approved. If not, try again. Except this time use stronger language, have the District Commander sign the request, and send it to the Regional Director's Office. This ploy usually works without failure. If it does not accomplish your desires it is recommended that the issue be turned over to Coast Guard Headquarters Chief Telecommunications Management Division. At the Headquarters level the problem can be solved between heads of agencies (probably staff members, however the signatures are usually from the top man). The decision here is generally favorable.

GSA telecommunications staff people are highly informed and anxious to help. They are, however, overworked and may resist because of this work load. If you stress the fact that GSA is a service agency and they are bound by executive order to assist you [32], the above problem should not be encountered, or will be minimal.

VIII. TELECOMMUNICATIONS INDUSTRY PERFORMANCE

A. CURRENT PERFORMANCE

The more than one-thousand independent telephone companies have joined together in a trade association called the United States Independent Telephone Association (USITA) [33, p. 282]. USITA is a trade association which establishes policies and technical standards for the independent telephone companies as well as being a lobbying group. However, when it comes to lobbying in Congress or fighting judicial decisions in the courts, USITA usually echoes AT&T's position and aids them in their lobbying effort or judicial fights.

The telephone industry, led by AT&T, has been against competition from its very beginning and has expended a great amount of effort and money in an attempt to keep the telephone industry noncompetitive. An outgrowth of the Specialized Common Carrier Decision of 1970 [34, p. 271] was the introduction of a service called "Execunet" by MCI which offered limited switching long distance service [35, p. 274]. As with the Carterfone Decision of 1968 [36, p. 32] and the Specialized Common Carrier Decision of 1970, the telephone industry, led by AT&T, fought the right of MCI to offer this competitive service through the Supreme Court and lost once again.

Because of these court cases, similar court cases, and several other reasons, the interconnect industry has experienced dramatic growth. One of the other reasons for this growth has been the dissatisfaction of users with the telephone company. This dissatisfaction applies not only to service but, to products. In most cases the products offered by the interconnect firms in the past, and those offered today are far superior to those products offered by the telephone company. Additionally, there are strong economic incentives for end-users to attain equipment from sources other than the telephone company. The telephone companies are public utilities, and as such can offer equipment only on a tariffed or rental basis. Hence, the user must pay for the use of the equipment for as long as he uses it, whether five, ten, or twenty years. Also, the user accures no tax benefit when he obtains equipment from the telephone company. However, when equipment is purchased from an interconnect vendor, the end-user is able to take full advantage of the investment tax credit, depreciation, and often other tax writeoffs.

In the late 1880's and early 1900's AT&T had managed to acquire a nearly complete monopoly on telephone service in the United States [37, pp. 21-26]. As a result, AT&T strongly fought against the increasing tide of government regulation of the telephone industry that was taking place at that time. In 1907, the J. P. Morgan interests took

control of the AT&T board and elected Theodore N. Vail as president [38, p. 122]. Vail was astute enough to conclude that not only was government regulation inevitable, but that it even afforded the Bell system protection from having to fight newly formed telephone companies. As a result AT&T became a champion of regulation.

In 1979, John D. DeButts took early retirement as chairman of the board of AT&T and was replaced by Charles L. Brown, who was formerly AT&T's chief financial officer (the AT&T "Hot Seat"), [39, p. 23]. By all appearances, it seems this was a signal to the industry that AT&T was preparing for a future in a competitive environment. As a result, they are now attempting to restructure themselves for prosperity in such an environmental setting. The hiring of Archie McGill from IBM, to reorganize the structure of AT&T as an active marketing organization serves as further evidence of this recent industry phenomenon. This "changing of the guard" at AT&T appears to be history repeating itself as it prepares for an inevitable change. Even though the Bell System continues to fight competition, it is simultaneously restructuring in order to service.

Several years ago while working as a technician in the telecommunications industry, the author witnessed the Bell System's reorganization of its marketing department along industry lines in an attempt to be in a better position to combat interconnect private branch exchange (PBX) vendors

who specialized in particular markets such as hotel/motel industry. Now Bell is reorganizing the entire corporate structure from the top AT&T policy making areas to the smallest local operating company work crew [40, p. 38]. In the past, the Bell System has been organized along functional lines. The major Bell System organizations were marketing, plant, and commercial. In the new structure organization will be vertical. The three divisions will be known as Business, Residential and Network. All functions that have to do with providing telephone service to business customers will ultimately report to one manager. Likewise, functions that deal with residential service rather than business service will report to a different manager. The Network organization will be responsible for maintaining the physical assets such as cable, central offices, and switching equipment, which are necessary for providing business and residential access. The ultimate goal of this reorganization is to make the Bell System more responsive to the customer's needs and to prepare system employees for the competitive market of the future.

The competitive climate can best be described as good. Everyone seems to be pro-competition in their thinking today. This includes the federal regulatory agency (FCC), the fifty state regulatory agencies, the federal judicial system, both houses of Congress, and the various state legislatures.

B. FUTURE DEVELOPMENTS

In addition to fighting competitors with better service, the telephone industry will continue to introduce new, modern competitive products. The Bell System, for instance, has introduced more new business systems in the last ten years than they did in the previous fifty years [41, p. 39].

Many people feel the world is presently experiencing an information explosion similar to the industrial revolution of the late nineteenth century. Several of the new inventions and developments are listed in Appendix D. Each of these has enormous potential. Taken in combination they will change the entire way of life as we know it today. Few technologies could have as profound an effect on human condition as the full development of these inventions, and certainly additional inventions in telecommunications are yet to come, some perhaps greater still than those we know today. These new means of communication have potential for both good and evil. They will forge links between people, raise productivity, and make the best and the worst of man's culture available to all, and they will provide new techniques of tyranny [42, p. 3]. In industrialized nations, these devices will provide the means of education needed to keep up with the ever increasing rate of change. In underdeveloped countries, they will provide the first hope of literacy and make way for new modern technology. However, along with education and culture, the changes can also bring propaganda,

cruelty, and distortion. Certain types of people may work at home much of the time, dialing computers and participating in teleconferences. In addition, they may shop at home, receive education at home, be entertained at home, and interlink each other's homes with video devices. Money transactions will probably be handled without cash or check, and man's credit rating will receive even more of a paramount role than today [43, p. 6]. As industrial automation grows, a higher proportion of people will work in service industries, and there will be an ever-increasing amount of leisure. Much of this new found leisure time will be taken up by telecommunication-related activities such as video computer games, big screen television, remote theatre, home radio, microwave/computer link-ups with friends, electronic cooking, home satellite terminals, etc... The list today is already becoming endless and we know of so much more potential.

In James Martin's book, The Wired Society, he examines how developments in telecommunications will affect the way we shop, bank, work, spend our leisure, form communities, educate our children, and govern ourselves. Although it is listed as a fiction novel, many of his teleliving examples are currently in use. I see his provacative creation as a preview of our societies absorption into telecommunications [44].

Perhaps the most optimistic and hopeful projection one can make about the impact of telecommunications in the information society of the future is the appearance of the

technical ability to monitor through satellites the activities of groups and subgroups organizing for the expression of hostility by the use of arms. Although disarmament has been a goal asserted from time to time by various groups in the world, only now is the mechanical means available to make universal world disarmament feasible. Because, the primary logical reason for avoiding disarmament is the gnawing fear that the potential opponent has not done so. By satellite surveillence man now has the technical ability to disarm and to know his potential enemies are keeping the bargain [45, p. 232].

Returning our focus to the telephone industry, the long-term outlook is excellent. Current trends are changing to a more competitive and innovative industry. As more and more interconnect vendors enter the market, their advertisements and attendance at trade shows and seminars will make communication managers, finance managers, and other key management personnel aware of the benefits of using modern telephone equipment. There are many other influences that are helping business become aware of alternatives to the telephone utilities. One of which is the mere population density of interconnect systems in use today. Few firms in the United States do not have some contact with other firms that have a successful interconnect installation. Additionally, it is not unusual to see articles stressing the value of competition in the telephone industry in business journals such as

"Business Week", "The Wall Street Journal", "Fortune", etc... In summarizing the future of the telecommunications industry, we can look forward to an innovative, competitive, and exciting group of decades ahead.

C. THE COAST GUARD'S ROLE

Recently a telecommunications management specialist for the General Service Administration, Region 9, gave the author a copy of a speech given to a Bell System Government Marketing Meeting at Kansas City, Missouti in April, 1979, titled, "The Emerging Federal Market Place". The following is an excerpt from that speech:

> "In the government we like to reorganize before someone does it for us. However, the Bell System with its re-structuring appears to be closing in fast for the same reason. We, in the government, are looking foward to your new marketing structure. We trust it will benefit us in improved service yield, innovative system design, and skillful consultation services, and that it will produce more competitive alternatives in pricing and product offerings." [46, p. 1]

This quote reasonably represents the Coast Guard's feelings on the forseeable competitve future and sets the state for the inevitable competitive future in telecommunications procurements.

As noted in Chapter Two, telecommunications usage in the Coast Guard and the federal government has been increasing rapidly in direct support of new expanding programs. Good management and effective use of present and future tele-communications technology can assist in increasing productivity

and mission performance without increasing the size of the budget or work force. In using telecommunications effectively we must ensure that costs are closely controlled, particularly when they are incurred to support communications of an administrative vice operational nature. The growth in Coast Guard telecommunications expenditures, the merging of automatic data processing (ADP) and telecommunications technologies, the growth of competition in marketing telecommunications services, and the desire to curtail federal expenditures have combined to emphasize the management of telecommunications resources [47, p. 2]. Effective management of Coast Guard systems can be accomplished only by an informed management force which, ensures that each individual user of the system is aware of the most economical use of the system. It will be necessary for this force of individuals to stay abreast of all changes in the innovative telecommunications industry which are beneficial to the Coast Guard work environment. These managers will also have to become intimently familiar with the accepted management practices in competitive procurement, and day-to-day operational management of Coast Guard telecommunications systems. In order to maintain a dependable staff of this nature we must continue to educate our personnel, read as extensively as possible all new material pertaining to our topic, and execute this accumulated knowledge on a daily basis.

APPENDIX A

GLOSSARY OF TELECOMMUNICATIONS TERMS

ACCESS LINES (AL) Circuits which connect PBX locations, ARS stations, key equipment and individual stations, to the network common control switching center.

ADVANCES RECORD SYSTEM (ARS) A leased teletype network which provides Federal Civil Government Departments and agencies with a unified communications system, geared to meet agency record requirements, emergency as well as day-to-day. It is the record portion of the FTS, managed by GSA.

AIRLINE MILEAGE (ARL MI) Straight line mileage from a switching machine or PBX to another switching machine, PBX or instrument. May be measured from point to point or rate center to rate center - used for billing.

ALL NUMBER CALLING (ANC) Telephone dialing codes consisting of all numbers - no letters.

ALL TRUNKS BUSY (ATB) A device to register each time all possible routes a call can travel are in use.

AMERICAN STANDARD CODE FOR INFORMATION INTERCHANGE (ASCII) a seven-bit plus parity bit code, used in the information interchange among systems and equipment.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY (ATT) The "parent" company of the Bell System which provides intercity and cross-country trunks.

ANSWERING TIME The time in seconds which elapses from the instant the switchboard lamp lights until the lamp is

extinguished by an operator inserting a plug into a jack. Alternately known as "Operator Answering Time" or "Operator Delay Time".

AREA CODE Three digit code used to call one telephone area from another.

ATTENDANT CONTROLLED TRANSFER (ACT) Calls transferred by an operator.

AUDIO FREQUENCY A frequency which can be detected as a sound by the human ear. The range of audio frequencies extends from approximately 20 to 20,000 hertz.

AUTOMATIC ALTERNATE ROUTING An automatic arrangement which permits routing from one trunk group to another trunk group when all trunks of the preceding group are busy.

AUTOMATIC CALL DISTRIBUTOR (ACDS) Equipment which automatically distributes incoming calls to attendants to balance the workload. Also "stores" calls.

AUTOMATIC DIGITAL NETWORK (AUTODIN) A worldwide system for communications other than voice. Used primarily by the military.

AUTOMATIC MESSAGE ACCOUNTING (AMA) Automatic recording of all data on customer-dialed calls for billing.

AUTOMATIC NUMBER IDENTIFICATION (ANI) Equipment which records the calling number.

AUTOMATIC VOICE NETWORK (AUTOVON) A worldwide direct dialing system used primarily by the military.

AVERAGE BUSY HOUR A hypothetical peak work hour derived from averaging the actual peak hours of two or more days.

"BACKBONE" NET A common expression depicting the Intercity FTS Network but not including local FTS access lines.

BANDWIDTH, NECESSARY For a given class of emission, the minimum value of the occupied bandwidth sufficient to ensure the transmission of information at the rate and with the quality required for the system employed under specified conditions. Emissions, useful for the good functioning of the receiving equipment as, for example, the emission corresponding to the carrier of reduced carrier systems, shall be included in necessary bandwidth.

BANDWIDTH, OCCUPIED The bandwidth occupied by an emission is the band of frequencies comprising 99 percent of the total radiated power extended to include any discrete frequency on which the power is at least 0.25 percent of the total radiated power.

BAUD A unit of signalling speed. The speed in baud is the number of code elements per second.

BAUDOT CODE A five-bit code used for teletype transmission.

BIT The smallest unit of intelligence possible to send on a data circuit.

BOOK MESSAGE Message destined for two or more addresses, but originator considers that no addressee needs to be informed of other addressees.

BUSY HOUR Peak 60 minute period of the day.

CALL DIVERTER A device which accepts a given set of dialed pulses and automatically reroutes them to a predetermined other number.

CALL FORWARDING Calls can be arranged to be rerouted automatically from one station to another.

CALL FORWARDING, BUSY LINE Incoming calls can be answered in those instances when both the called number and numbers designated as alternate answering points are busy. The incoming call will then automatically be transferred and answered at the attendants position.

CALL FORWARDING, DON'T ANSWER Following a pre-determined number of rings, incoming calls will automatically be transferred to the attendants position for handling.

CALL HOLD An existing call can be held while placing a second call within the system and then return to the original call.

CALL TRANSFER, ATTENDANT The attendant can transfer existing calls from one station to another. Depressing the switchhook on the station signals the attendant who will effect the transfer.

CALL TRANSFER, INDIVIDUAL Depressing the switchhook puts an existing call on hold and gives a second dial tone. The transfer is completed by dialing the desired number and then hanging up.

CALL VALUE The average time used by a telephone operator to perform all operations incident to the handling of a call through a switchboard.

CAMP-ON Holding a call for a line in use and signalling when it is free.

CAPACITY CALL SECONDS One hundred call seconds. An engineering coefficient computed from a combination of work plus conversation time which theoretically limits one trunk to a capacity of thirty-six calls per hour.

CARD DIALER Automatic dialing unit combined with regular telephone.

CARRIER SYSTEM A means of obtaining a number of channels over a single path by modulating each channel upon a different "carrier" frequency and demodulating at the receiving point to restore the signals to their original form.

CENTRAL OFFICE (CO) A telephone company switching unit, used to switch local calls and route long distance calls to another central office or to a CCSA. Also called Telephone Exchange.

CENTRALIZED AUTOMATIC MESSAGE ACCOUNTING (CAMA) Similar to AMA-serves several central offices. May be used without ANI when operator records calling number.

CENTRAL OFFICE TRUNK A circuit between PBX and a CO.

CENTREX (CTX) A PBX in which incoming calls are dialed direct to extensions without operator assistance. Centrex CU has switching equipment on-premise with the switchboard; Centrex CO has switching equipment in the commercial telephone exchange.

CHANNEL A path for electrical transmission. May be wire, radio, TV or data. Synonymous with circuit.

CIPHER, ON-LINE An automatic method of encryption associated with a particular transmission system, whereby signals are encrypted and passed direct to line, to operate the reciprocal equipment at the distant station.

CIRCUIT (CKT) An electrical path in which energy travels.

COEFFICIENT A number used as a multiplier to establish a unit of work. Traffic coefficients are established by application of a formula to various switchboard operations, teletype operations, trunk usage counts and switch counts. The coefficient reduces the actions under study to a common denominator, which can then be applied to standard engineering formulas or tables.

COMMON CONTROL SWITCHING ARRANGEMENT (CCSA) A switching machine which stores dialed impulses and then selects routes between Number Plan Areas.

COMMON DISTRIBUTABLE RATE (C/D) Per station rate levied on other agencies by GSA to recover services and equipment costs.

COMMUNICATIONS COMMON CARRIER A company which provides communications services, or classes of communications services to the public and whose charges and service are subject to public utility regulation.

CONTENTION A condition on a multi-point communication channel when two or more locations try to transmit at the same time.

CONTINGUOUS EXCHANGE A telephone exchange area bordering upon another.

CONTINUOUS PROPERTY MILEAGE Billing mileage between buildings within the confines of a Government reservation.

CREDIFIER A trade name of a computer-type device, operated by push buttons, to aid switchboard operators in routing of calls.

CROSS TALK The unwanted transfer of energy from one circuit called the "disturbing" circuit, to another circuit called the "disturbed" circuit.

CROSSBAR (X-BAR) An arrangement of dialing switching devices in a telephone system by mechanical means.

CRYSTAL (XTAL) A slice of a substance such as quartz or tourmaline which exhibits piezoelectric characteristics. It has the property of responding markedly to a given frequency when cut to a given thickness.

CUSTOMER OWNED AND MAINTAINED (COAM) A complete PBX or Centrex owned and maintained by the user of the service.

DATA CIRCUIT An electrical path used to transmit data. In the FTS, usually a voice circuit connected to a computer or business machine by an interface.

DATA-PHONE An ATT trademark. A device to adapt voice circuits to data transmission. Connects computers through the telephone system.

DATA PROCESSING, AUTOMATIC (ADP) The recording, filing, computing, and production of data by means of electronic computers and associated auxiliary equipment.

DATA-SET An interface between business machines and voice circuits for data transmission.

DEGRADATION A condition in which the system continues to operate, but at a reduced level of service. Unavailability of major equipment subsystems, or components is the usual cause.

DIAL ACCESS CENTRAL OFFICE TRUNK A direct circuit between a PBX and a telephone Central Office to which all stations have access by dialing a given digit.

DIAL ACCESS REPEATING TIE LINE A direct circuit between two PBX's, to which all stations have access by dialing a given digit.

DIAL TELETYPEWRITER EXCHANGE SERVICE Teletypewriter traffic switched by dial equipment vs operators. When operator switches manually, term is TWX - teletypewriter exchange service.

DIGIT One of a series of pulses made by a dial.

DIGIT ABSORBING TRUNK An internal wiring arrangement to adapt incoming trunks of small PBX's to the standard ten digit numbering plan. In the FTS system, term is synonymous with Listed Number Trunk (LNT).

DIRECT DISTANCE DIALING (DDD) Station-to-station dialing over long distance trunks.

DIRECT IN-DIAL (DID) Also network-in-dial (NID). Direct dialing to a called PBX station in the network.

DIRECT IN-AND-OUT-DIAL (DIOD) Also Network In-And-Out-Dial (NIOD). Direct dialing to and by PBX stations through the network.

DIRECT OUT-DIAL (DOD) Also Network-out-dial (NOD). Direct dialing by the calling PBX station over the network.

DIRECTIONALIZED TRUNKS A restrictive arrangement of a trunk group whereby approximately half the group is two-way into and out of the PBX: one-quarter of the group is outgoing only from the PBX and the remaining quarter is incoming only to the PBX. This aids in control of traffic volume and helps avoid overcrowding of the network by a few very busy locations.

DUPLEX A telephone term indicating a type circuit over which simultaneous transmission is possible. More accurately called Full Duplex. Transmission in one direction at a time is called Half-Duplex.

DUPLEX OPERATION Duplex (or full duplex) operation refers to communication between two points in both directions simultaneously.

ELECTRONIC SWITCHING SYSTEM (ESS) A communications switching system which uses solid state devices and other computer-type equipment and principles. It operates in millionths of a second and gives customers many new services.

ESSENTIAL SERVICE See Line Load Control.

EXCHANGE A general term used by telephone companies to denote a room or building equipped to switch telephone lines. More properly called by the full title of "Telephone Exchange". May be automatic or manual.

EXCHANGE AREA A given geographical area served by one or more telephone central offices.

EXCHANGE, PRIVATE BRANCH, AUTOMATIC (PABX) An exchange at which communication between subscribers is effected without the intervention of an operator, by means of switches set in motion by the operation of a dial on the originating subscriber's instrument. Incoming dial calls to stations must be completed by the operator.

EXCHANGE, PRIVATE BRANCH (PBX) A switchboard, installed to provide facilities for making outside calls and for intercommunication for all subscribers. All calls must be completed by operator.

EXCLUSIVE-USE EQUIPMENT Any equipment requested by and paid for by a user. Includes, but not limited to: KTS,

trunks, mileage to off-premise locations and data transmitting equipment.

EXTENDED AREA Exchange service into other exchange areas without toll charges but with a higher fixed monthly rate.

EXTENSION STATION (EXT) One or more telephones connected to a main station and having the same number as the main station.

FACILITY, SWITCHING A communications facility which affects the onward transmission of information, through interconnection of circuits, loops, channels, or trunks.

FACSIMILE (FAX) Transmission of pictures, maps, etc., in hard copy form via telephone line.

FINAL ROUTE TRUNKS Circuits between Telco switching machines which handle regular traffic between cities and overflow from High Usage trunks.

FEDERAL TELECOMMUNICATIONS SYSTEMS (FTS) A leased, nationwide communications network provided by the ATT and managed by GSA.

FTS TOLL CHARGE A charge for completion of an incoming FTS call over commercial facilities when leased circuits, such as WATS, are all busy or not available.

FLAT RATE AREA A geographical area designated by a telephone company in which the established rate is considerably higher than in measured areas, but there is no limit on the number of local calls which can be made without additional cost.

FOREIGN EXCHANGE SERVICE (FXS) A trunk, paid for on a flat monthly rate connecting a PBX to a remote telephone exchange or area code. It may be either dialed direct by stations or operator-controlled.

HIGH USAGE TRUNKS The first choice (by automatic switching equipment) in a given group of intercity trunks which connect localities with a high community of interest.

HOLDING TIME The total time a circuit is in use, including dialing time, operator's time and conversation time, measured in capacity call seconds.

INDICATOR, ROUTING A group of letters assigned to identify a station within a tape relay network to facilitate routing of traffic.

INTERCITY SERVICE - SYSTEM COST - (CENTRAL OFFICE ONLY) A billing concept wherein station lines are mechanically limited to FTS access only and all costs (except key station equipment) are charged to the FTS. May be OPX's from a GSA switchboard which are restructed from local service or termination in an instrument connected directly to a switching machine.

INTERCOMMUNICATION SERVICE (INTERCOM) A wiring arrangement between instruments permitting conversation without entering the network.

INTER-EXCHANGE CHANNEL A numbered channel between telephone exchanges.

INTER-EXCHANGE PRIVATE LINE A leased circuit between contiguous or non-contiguous telephone exchanges used to provide a path for access lines, OPX's, etc.

INTERFACE A device or arrangement to connect two or more items of equipment which would not otherwise be compatible.

JACK A connecting device on the face of a switchboard or on a subscriber line into which a plug can be inserted.

JACKSTRIP A row of jacks on a single mounting. Usually ten to twenty per strip.

JUMPER Short length of wire used as a temporary connection.

KEY Hand operated switching device on switchboards and telephones. (Also pushbutton)

KEYBOARD Mounting arrangement for keys.

KEY TELEPHONE SYSTEM (KTS) An arrangement wherein two or more telephones are equipped with keys or buttons for intercom, holding and pickup of additional lines.

LINE A common term used to denote any circuit connecting two or more communications devices.

LINE LOAD CONTROL Also "Priority Control" or "Essential Service". A mechanical arrangement to deny dial tone for out-going calls to low priority users during emergency periods when the system is momentarily swamped with calls. May be applied to, PBX trunks, PBX or CTX stations, or home telephones.

LISTED NUMBER TRUNK The advertised number of a switchboard. Term is synonymous with Digit Absorbing Trunk in the FTS system.

LONG LINES Long lines include all forms of physical conductors used for communication purposed such as open wire systems, underground and overhead cables, and submarine cables, but do not include local circuits. They also may contain radio relay systems when they are integrated with the wire system. In FTS usage, normally intercity trunks, but may be OPX's which extend beyond a contiguous exchange boundary.

MAIN STATION A single telephone with a distinct number, directly connected to a PBX.

MANUAL CENTRAL OFFICE TRUNK A direct circuit between a PBX and a telephone central office to which only the PBX operator has access.

NETWORK CONTROL SIGNALLING UNIT Normally a telephone set that controls the transmission of signals into the telephone system which perform supervision, number identification and control of the switching machines.

NIGHT SERVICE After hour calls automatically bypass the attendant position and ring at pre-determined stations.

NUMBER PLAN AREA A geographical area with a distinctive three-digit area code,..,the first three digits of a ten digit telephone number.

NIGHT CONNECTION BRIDGE A special cord connection put up after normal duty hours at a non-Centrex location to permit incoming calls to be dialed directly to a main station.

NNX CODE First three digits of a seven digit telephone number.

OFF NET COMPLETION TRUNK A manual Central Office trunk reserved for completion of off-net calls from the FTS.

OFF PREMISE EXTENSION (OPX) A main station connected to a PBX in a different building (location).

OFFERED CALLS All attempts, completed or not, by persons or machines, to place calls.

PERCENT OCCUPIED TIME The percentage of a work hour in which an operator, switching equipment or trunk is in actual use (not at rest).

PERFORATOR A machine for punching holes in paper tape manually.

PICTUREPHONE A registered trademark of the ATT Company to identify a telephone service that permits the user to see as well as talk with the person at the distant end.

PILOT NUMBER The listed number of a PBX.

POINT-TO-POINT COMMUNICATIONS Communications between two fixed locations.

POSITION The area of a switchboard arranged to be operated by one person.

POSITION REQUIREMENT A determination, arrived at as a result of studies of existing locations or estimates for proposed locations, of the number of switchboard operating positions required.

PREFIX The first three numbers of a seven digit telephone number. In teletype, part of the routing code which precedes the header.

PRIVATE AUTOMATIC BRANCH EXCHANGE (PABX) Same as PBX, except add automatic where manual appears.

PRIVATE BRANCH EXCHANGE (PBX) A manual or dial type switchboard, together with associated switching equipment, trunks, main and extension stations and connecting lines.

PRIVATE LINE (PL) A point-to-point arrangement with no connection to a PBX or network. Usually a special circuit such as a fire or guard telephone.

RATE CENTER Geographical points of given latitude and longitude representing disignated exchange or district areas between which mileage measurements for inter-exchange rates are made.

REIMBURSABLE TOLL CHARGE A charge levied by a telephone company for a call placed over commercial facilities from a PBX or station.

RELEASE LOOP A mechanical arrangement at a Centrex whereby an operator can connect an off-net caller to an FTS access line and, when the connection is complete,

release the cords used, freeing them for the next incoming call.

REPEATER STATION An intermediate point in a transmission system where line signals are received, amplified or reshaped, and retransmitted.

REPERFORATOR A device which automatically punches a tape from received signals.

RINGDOWN Method of signalling an operator by means of a self-locking relay and lamp.

ROTARY LINES An automatic method of selecting the next idle telephone number in a given group of numbers when the called number is busy.

ROTARY OUT TRUNK SERVICE An automatic method of selecting the next idle trunk in a group of dial trunks.

SATELLITE PBX An unattended PBX which homes on a main PBX. Usually has the same listed number as the main.

SERVICE TERMINAL Formerly called Channel Terminal. Equipment utilized by the telephone company to enter a circuit into a Telpak channel.

SIMULATED WATS A special billing arrangement whereby calls completed via commercial toll when all WATS trunks are busy are specifically identified.

SPEAKER PHONE A telephone equipped with a special loud speaker and transmitter which can operate with the handset on the cradle. Incoming conversation can be heard throughout the room and sound within the room will be transmitted.

STATION HUNTING Incoming calls to a busy station will automatically be routed to a predetermined alternate station.

STATION-TO-STATION CALLING Calls are placed from station to station without the aid of the attendant by dialing two to four digits.

STEP-BY-STEP Automatic dial system in which dial impulses activate a series of switches in succession.

STORE-AND-FOREWARD Process of message handling used in a message switching system.

SWITCHED CIRCUIT AUTOMATIC NETWORK Large switching centers for switching long distance trunks.

SWITCHBOARD (SWBD) A manually operated apparatus wired and arranged to switch telephone or teletype circuits.

TARIFF The published rate for a specific unit of equipment, facility, or type of service provided by a communications common carrier.

TELETYPE Trademark of the Teletype Corporation. Usually refers to a series of different types of equipment such as transmitters, tape punches, page printers, utilized for communications systems.

TELETYPEWRITER (TTY) Trade name used by the Bell System to refer specifically to telegraph page printers. The equipment transmits and/or receives taped records or perforated tapes at speeds from sixty to one-hundred words per minute.

TELETYPEWRITER EXCHANGE SERVICE (TWX) An automatic switching service provided by the Bell System for interconnecting public Teletypewriter subscribers.

TELEX An automatic switching service provided by Western Union for inter-connecting public teleprinters or subscribers.

TELEX COMPUTER COMMUNICATIONS SERVICE (TCCS) A Western Union facility to permit access to computers through company networks.

TELPAK Circuits leased from ATT at quantity discounts.

TERMINAL 1. A point at which information can enter or leave a communication network.

2. An input/output device designed to receive or send source data in an environment associated with the job to be performed and capable of transmitting entries to and obtaining output from the system of which it is a part.

TIELINE (TL) A direct circuit between two PBX's or teletype stations. On PBX's, may be arranged for dial access by all stations or operator access only.

TOLL Charge made for commection beyond an exchange boundary.

TORN-TAPE-SWITCHING Manual teletype switching system in which paper tapes received at a center are carried to a transmitter for retransmission to their final destination.

TORN-TAPE SWITCHING CENTER A location where operators tear off incoming printed and punched paper tape and transfer it manually to the proper outgoing circuit.

TOUCH-TONE A registered trademark of the Americal Telephone and Telegraph Company which identifies its push-button dialing service.

TOUCH-TONE PAD A set of pushbuttons used in lieu of a dial at a switchboard or telephone instrument.

TRAFFIC The total information flow in a communications system. This would include conversations, written messages, facsimile and data.

TRAFFIC ANALYSIS A study of telephone or teletype traffic volume, routing, etc., to determine level of service required and most economical means of obtaining it.

TRAFFIC UNIT A measure of traffic volume, determined by the number of times in a work hour in which an operator can complete the several types of calls normally handled, within the approved answering time.

TRIBUTARY PBX An attended PBX which homes on and uses the facilities of a main PBX, but has a different listed number.

TRUNK A circuit between switchboards or between a switchboard and a telephone central office. In ARS, a channel between district, junction, switching centers and/or message distribution points.

TRUNK GROUP A specified combination of trunks between switching facilities.

TRUNK USAGE STUDY A procedure whereby trunk usage is measured and analyzed to determine if the number of circuits is adequate. May be done by meters, registers or actual count of switchboard lamps or switches at given time intervals of one, two, five, or more minutes.

TWO MINUTE COUNT A trunk usage study accomplished by counting the number of trunks in use at two minute intervals.

VOICE CONNECTING ARRANGEMENT Permits direct electrical connection of customer-provided voice transmitting and receiving equipment to the telephone network.

VOICE GRADE CHANNEL A channel suitable for transmission of speech, digital or analog data, or facsimile, generally with a frequency range of about three-hundred to three-thousand Hz.

WIDE AREA TELEPHONE SERVICE A service provided by ATT which provides a special line allowing the subscriber to make unlimited calls to any location, in a specific zone, on a direct-distance dialing basis, for a flat monthly charge. (WATS)

ZONING A system for selecting the type of subscriber's telephone instruments based on the electrical distance to the central office from which they are served. Places the older, less efficient instruments close to the central office.

APPENDIX B

MAJOR REGULATORY DEVELOPMENTS IN TELECOMMUNICATIONS SINCE 1962

1962: The Communications Satellite Act, which established COMSAT, effectively prevented the use of satellites for transmission within the United States.

1963: Microwave Communications Inc. (MCI) files for permission to construct a common-carrier microwave system from St. Louis to Chicago.

1966: The FCC initiated a Computer Inquiry to resolve the "regulatory and policy problems by the interdependence of computer and communications services and facilities".

1968: CARTERFONE DECISION. This landmark decision followed a long antitrust action by the Carter Electronics Corporation who wanted to couple their mobile radio system to the telephone network. The FCC ruled that the below wording in the ATT tariff (Tariff #263) which was in force was unreasonable and should be removed. This wording was as follows:

> "no equipment, apparatus, circuit, or device, not furnished by the Telephone Company shall be attached to or connected with the facilities furnished by the Telephone Company, whether physically, by induction or otherwise (with specified exceptions for police, hospitals, etc...)."

The ruling which revitalized the telecommunications industry said,

> "A customer desiring to use an interconnect device... should be able to do so, so long as the interconnection does not adversely affect the telephone company's operations or the telephone system's utility for others."

1968: The Justice Department Antitrust Decision urges the FCC to allow CATV to develop as a competitive medium and to permit CATV program origination and advertising.

1968: The President's Task Force on Telecommunications Policy provided the following:

> "We have been guided by the basic premise underlying the law and policy affecting American industry and commerce: that, unless clearly inimical to the public interest, free market competition affords the most reliable incentives for innovation, cost reduction, and efficient resource allocation. Hence competition should be the rule and monopoly the exception."

1969: An AT&T revised tariff came into effect permitting the direct interconnection of customer equipment via a "direct access arrangement: provided by AT&T, which protects the network. The device limited the input signal strengths and performed all network control signaling functions. This signalled a rapid growth in the "interconnect industry" making PABX's, modems, decorator telephones, radiophones, and other devices for interconnection to the telephone network.

1969: FCC permitted all CATV systems to originate their own programming.

1969: A milestone decision by the FCC permitted MCI to begin construction.

1969, 1970: Many firms apply for permission to become specialized common carriers, and the established carriers petition the FCC to reverse its MCI ruling.

1970: The Office of Telecommunications Policy was established as an executive branch of government to study in depth long-range policy alternatives and make recommendations to the FCC and Congress.

1970: The FCC permitted CATV to import distant signals, and substitute commercials on them.

1970: The FCC prohibited telephone companies from operating CATV systems in markets where they have telephone facilities.

1970: The Office of Telecommunications Policy recommended that any financially and technically qualified entity should be permitted to establish and operate domestic satellite facilities.

1971: The FCC formulated the "open skies" policy.

> "we will consider applications by all legally, technically, and financially qualified entities proposing the establishment and operation of domestic communications satellite systems designed to provide the capability for multiple or specialized communications services."

1971: After lengthy hearings the FCC gave an overall policy approval to the specialized common carriers concept (Docket #18920). This further encouraged the rapid

growth of the specialized common carrier industry.

1971: The Office of Telecommunications Policy recommended that "second-tier" common carriers should be permitted to develop and offer new services derived from "first-tier" carrier channels.

1972: The FCC ruled that:

1. Cables must have at least 20 channels.
2. Cables must have built-in capacity for two-way communication.
3. For each broadcast channel carried, there must be an equivalent bandwidth for nonbroadcast users.
4. There must be one free, dedicated, noncommercial uncensored, public-access channel available on a non-discriminatory basis.
5. There must be one channel for educational and one channel for local government use, free of charge, and in addition to item 4 above. These channels must be set aside for five years.
6. Minimal production facilities for public use must be maintained.

1972: Eight major domestic satellite applications were receive by the FCC. Restrictions placed on two of these (AT&T and COMSAT) were "to minimize the effects that AT&T's economic strength and common carrier dominance and COMSAT's role in Intelsat and relation

to AT&T might have on multiple entry by new carriers during the difficult start-up periods." AT&T was permitted to lease space from COMSAT for an initial period of three years but only for MTS, WATS, AUTOVON, emergency restoration during terrestrial outages, and for services to Alaska, Hawaii, Puerto Rico, and the Virgin Islands.

1973: The Computer vs. Communications inquiry terminated and the FCC defined the services provided (FCC Docket #16979):

NOT TO BE REGULATED:

1. Local data processing.
2. Remote access data processing.
3. Hybrid data processing.

REGULATED BY THE FCC:

1. Hybrid communications.
2. Message and packet switching.
3. Pure telecommunications.

Hybrid data processing was defined as "a hybrid service offering wherein the message switching capability is incidental to the data processing function or purpose". Hybrid communications was defined as "a hybrid service offering whereing the data processing capability is incidental to the message switching function or purpose".

1974: Western Union launched WESTAR I and II.

1974: The Justice Department Antitrust Division recommended that AT&T should be broken up, with equipment procurement being done on a competitive basis rather than from a wholly-owned subsidiary, and interstate transmission being operated by a seperate corporation.

1975: A joint IBM-COMSAT application for a domestic satellite license was disallowed, but the participants were informed that further modification of their application encouraging competition would enhance the possibilities of receiving approval. A new IBM-COMSAT-Aetna Life application in which IBM had only 40% was allowed and they were given permission to operate a demand-assigned multiple-access satellite system (SBS).

1976: AT&T drafted the Consumer Communications Reform Act which would declare that actions to encourage competition for long distance and interstate private line services are contrary to the public interest if such competition does not provide innovative service and establish new markets. The Act would affirm the authority of states rather than the FCC to regulate interconnection to the telephone network. If the Act became law it would eliminate most telecommunications competition in the U.S.A. and hence be the end of an era of innovation.

1980: The Consumer Communications Reform Act has long since died in both Houses. However, both the Senate and House of Representatives are attempting to write a new Communications Act which will provide up-to-date guidance in regulating the telecommunications "multiindustry". Several attempts have already fell short. It will be interesting to see what happens in 1981.

APPENDIX C

UNITED STATES COAST GUARD DRAFT
TELECOMMUNICATIONS PROCUREMENT GUIDE

I. TELECOMMUNICATIONS SYSTEM PROCUREMENT GUIDE

The purpose of this guide is to facilitate the procurement of cost effective and operationally responsive telephone and telecommunications services for the Coast Guard.

The provisions of Office of Management and Budget (OMB) circulars, General Services Administration (GSA) Federal Property Management Regulations (FPMR), Coast Guard Policy, and other directives are often confusing and sometimes appear contradictory. This guide is designed to provide a brief discussion of portions of these directives and regulations that apply to procurement of telecommunications services and equipment and to help put them in perspective. They are referenced by section to ease further research. The guide then discusses the various alternatives that can be pursued in procuring services and suggests a step by step process to use in developing and evaluating alternatives. The implications of various regulations and directives are pointed out where necessary. The guide then suggests and discusses several strategies that may be used to fund procurements. Finally, the guide provides a sample telephone system performance specification that may be used as an aide in conducting a competitive procurement if that alternative

is selected. Note that the effort required to perform a competitive procurement makes it wise to exhaust all other alternatives first.

This guide can only be a beginning. It is no substitute for in-depth knowledge of the various regulations and directives involved. This guide alone does not provide justification to take any action; any question or conflict must be resolved in favor of the applicable regulations. In addition, personnel with specialized knowledge, such as in telecommunications, contracting, engineering, or law, should be consulted when necessary. This guide will, hopefully, provide an overall description of the applicable regulations and directives, a framework in which to conduct procurement projects, and point to where to go for further research to obtain more detailed understanding.

The term procurement here refers to obtaining new service or equipment or replacing existing service or equipment. It does not imply "buying" since procurement may result in lease, buy, or various lease buy agreements. The guide is aimed primarily at telephone service, but applied equally to specialized telecommunications services or equipment. Services that require adherence to rigid engineering specifications rather than the more general performance specifications of a telephone system may require a different form of procurement document than discussed here, but the discussion of regulations and directives still apply.

Finally, this guide is intended to be, and must be evolutionary. To be of any use, it must be changed periodically to reflect changes in the rules of the game and to reflect experience gained. Any comments on the content or format are welcome.

II. OFFICE OF MANAGEMENT AND BUDGET (OMB) CIRCULAR A-76

OMB Circular A-76 is discussed below in two sections. Section 1 provides a discussion of the concept behind A-76 and of some of its ramifications. Section 2 describes what will be the two levels of compliance that we will see for Coast Guard telecommunications.

1. The concept embodied in A-76 is simple and straightforward: It is the policy of the Federal Government to rely on commercially available products and services to the maximum extent; it is not in the interest of the nation for the Government to compete with its citizens. The implementation of A-76 is more difficult, and harder to understand. Conceptually it can be simplified with a few explanations:

a. An A-76 analysis, though composed of economic factors, is not an "economic analysis" in the meaning usually attributed to that term. It is not intended to consider all possible alternatives, or to identify the least costly. It is used to determine whether the Government should perform a function in-house or by contract. In this sense, it is more a policy tool than an analytical technique. The treatment of

overhead costs for Government performance is exhaustive, for example, and is viewed by some to somewhat overstate these costs, but arguments about the validity of the cost factors in the A-76 circular are irrelevant to agencies tasked to comply. In fact, the government is willing to accept a slightly highly dollar cost in favor of encouraging use of the private sector to obtain goods and services.

b. An A-76 analysis is not a "Buy vs. Lease" decision. It is performed to determine if a service is to be provided commercially or by the government itself. The owner of title to a piece of equipment, Government or a contractor, is not an A-76 matter (though it is a contractual matter; see c. below). Though it is difficult to clearly prove this with the wording of the circular, there are several points that support this interpretation:

1. To make the lease/buy decision with A-76 would contravene Procurement Regulations and would serve to restrict competition since vendors who offer to sell might be discriminated against. The circular specifically states that acquisition regulations issued in accordance with law remain applicable, meaning that the circular does not substitute for or alter contracting law or regulations. See paragraph 6.a, and d.(1) of the circular. Also, the transmittal memorandum states that the approach of the circular is designed to, among other things, achieve equitable treatment of all parties. Eliminating a sizable portion of the competition in the open market is not equitable treatment.

2. Another design listed in the transmittal memorandum is to achieve improved economy and efficiency in government. Limiting competition by denying the option to purchase would often result in higher cost. A recent example is a $400,000 telephone system procurement in the Coast Guard where the "buy" option offerred an approximate 19% savings over the life cycle of the system over the "lease" option.

3. The questions to be asked are: Who designs it? Who engineers and manufactures it? Who installs it? Who maintains and operates it? An item like a switchboard, if procured in accordance with all applicable regulations, is commercially obtained whether it is purchased or leased since it has been designed, engineered, and manufactured commercially. The determination of who is to install, maintain, and operate the system is where the A-76 circular must be applied.

4. The source of the problem in interpreting the circular in telecommunications lease/buy matters can be seen in the history of the circular and in industry trends. When A-76 was first issued in 1966, and indeed throughout the majority of its life, users had two basic options in obtaining telecommunications services; To lease the service directly from the local telephone company or AT&T; or to buy, install, and maintain the system themselves. In recent years, users have had a myriad of options open to them as competition has been introduced into the industry. The wording of the circular just has not caught up with reality. Before competition,

the A-76 issue could be represented by the term "lease vs. buy", but no longer.

5. At first glance, this may appear to contradict the comments on Government-Owned, Contractor-Operated (GOCO) facilities contained in OMB's transmittal memorandum No. 4, dated 29 March 1979, and paragraph 6.c. of the circular itself. However, they discuss "activities" and "facilities", not "equipments". The difference is very important, though not well defined by the circular. A-76 applies only to "a regularly needed activity of an operational nature, not a one time activity of short term duration" (see paragraph 5.a. of the circular). Therefore, it does not generally apply to equipment procurements, but would apply to the operation and maintenance of the equipment. For example, a telephone switchboard is clearly an item of "equipment", the procurement of which A-76 does not apply to. But operation and maintenance of the switchboard constitute activities to which A-76 apply.

6. Further support of this position is provided by Office of Telecommunications Policy (OTP) Circular No. 13, which remains in force under the authority of OMB by order of OMB Bulletin No. 78-15 dated 30 June 1978. OTP Circular No. 13 states that it is the policy of the Federal Government to place heavy reliance on the private sector for telecommunications services. It discourages agencies from procuring "facilities, rather than services", but does not define

"facilities". It uses the phrase "functions normally associated with providing the service" to explain "facilities", and lists those functions as design, engineering, system management and operation, maintenance, and logistical support. It does not address ownership of the equipment itself.

c. The A-76 analysis is not used to analyze bid offerings in a competitive procurement, or to make the lease/buy decision. To do so would have the effect of restricting competition since it would bias the life cycle cost analysis. Life Cycle costing techniques are used to analyze bid offerings in accordance with normal contracting procedures. The lease/buy decision is determined on the basis of least life cycle cost to the Government. If the results of the competitive procurement are to be used in comparison with Government cost estimates to decide if the service is to be provided in-house or commercially, an A-76 analysis would be performed using the information provided by the "winning" offerer in comparison to the Government's "bid".

d. The provisions of the A-76 Circular are not basis for appeal of contracting decisions made by the Coast Guard to authority higher than the Department of Transportation. Paragraphs 11.a. and b. of the circular state that appeals may be made to the agency which originally made the decision, but no further. The Comptroller General of the United States has consistently upheld that concept. A recent example is a Comptroller General decision (file number B-194580 dated

31 July 1979) involving a dispute between St. Josephs Telephone & Telegraph Company and the Army Corps of Engineers. The Comptroller stated, in refusing to consider an appeal of a contracting decision based upon an A-76 dispute: "We have repeatedly held that determinations made....under (A-76).. are matters of Executive Policy which are outside the scope of the bid protest decision-making process".

e. There is a difference between "review" and "analysis". An analysis is the formal cost comparison analysis performed in accordance with the cost analysis handbook which accompanies the circular. A review, however, is an examination of all the facts concerning the facility or function in question, including a determination of whether that function is to be waived or not. If waived, the review process ends at that point; if not, an analysis is required. Thus a review may or may not include an analysis.

f. Paragraph 10.b. of the circular requires that inventories of activities that could conceiveably be contracted (whether they are contracted now or not) be drawn up. The inventories are divided into categories, some of which are waived from analysis requirements. This requirement was implemented in COMDTNOTE 4200 of 28 Jan 80, which provided an excellent description of what constitutes the various categories. Telecommunications services, in general, fall into the category of services which should be contracted. Waivers would include:

1. Systems located aboard a cutter or mobile command post (Transportable Communications Central, Strike Team Van, etc.).

2. Systems in areas where adaquate commercial service is not available (remote light stations, etc.). However, before a determination can be made that no satisfactory commercial source is available, a solicitation for bids must be prepared and advertised in the Commerce Business Daily.

3. Locations where Coast Guard ownership and maintenance is required to meet rapid response operational or military readiness requirements. Be careful if you try to use the third arguement to justify ownership of equipment in a procurement. Though the same Comptroller General decision discussed in 1.d., above upheld the Army Corps of Engineers on their determination that Government maintenance and ownership was required on the basis of the justification provided, he recently sided against the Navy in a similar claim where the justification did not hold water. See Comptroller General decision B-192171 dated March 14, 1979 involving a dispute between Peninsula Telephone and Telegraph Co. and the U.S. Navy. The same concept would apply to trying to seek a waiver under A-76.

g. Paragraphs 10.c. and d. of the circular require reviews to be performed. In short, there are four categories of interest to us:

1. All activities that are now performed in-house must be analyzed within three years and once each five years thereafter unless waived. Note that there is no "threshold" dollar cost; all activities must be reviewed. Paragraph 9.b(1) requires that the cost figures used to represent contract costs "be based on a binding firm bid, solicited in accordance with pertinent acquisition regulations". This means that a competitive procurement document must be prepared and bids solicited for each analysis. Bidders must be told "that an in-house cost estimate is being developed and that a contract may or may not result, depending on the comparative cost of the alternatives". This provision may significantly affect vendor's willingness to expend the funds necessary to respond with bids, and may be a significant problem in the future.

2. A-76 type activities that are currently being performed inhouse, but which involve less than $100,000 in annual operating costs should be contracted without review (see paragraph 9.a.(5) of the circular). This provision obviously has significant implications for the Coast Guard, and will require modification in implementation.

3. Activities that are now contracted in which the contract cost is in excess of $100,000 annually must be reviewed. If the agency believes that the function can be performed in house at a cost that is less than contract performance by 10% of Government personnel costs plus 25% of the cost of ownership of equipment and facilities, an analysis

must be done. Note that this is required even if the agency has no desire or intent to perform the function in-house.

4. New starts, which are new activities to be performed in-house, including a change from contract to in-house performance, if not waived, may not be made unless indicated by an A-76 analysis (See definition of "New Start" in paragraph 5.d. of the circular).

h. Paragraph 10.d.4. of the circular provides allowance for issuing contracts without an A-76 analyses if in-house performance is not feasible. The term "not feasible" is not defined, but could be reasonably interpreted to mean that the agency does not have adequate resources (such as no appropriate personnel or physical plant available to manage, maintain, and operate a facility or system) to undertake the effort in-house. However, paragraph 6.d.3. specifies that conversion to contract solely to meet personnel ceilings is not allowed. The distinction between "personnel ceilings" and "lack of adequate resources" will have to be clarified, but since a budget item for additional technicians to service a telephone system where commercial service is available would not likely succeed, a new start would not appear to be feasible in most of our situations.

i. The situation of attempting a "new start" with excess personnel resources from an existing maintenance facility (such as under-utilized TTs at a local ERS or ESMT) is not as simple as it may appear on the surface. A zero personnel

cost cannot be used for the analysis, because those excess resources should not normally be there. If they are, it may be an indication of poor management, and the staffing of that facility should be carefully examined before the excess personnel time is obligated with zero cost allocation to another task. However, if the costs of personnel resources are properly allocated to the various functions to be performed, and the functions stand up to analysis under the circular, then that course of action is appropriate. The end result is that each function must be considered as a part of an overall system, and their effect on each other cannot be overlooked.

2. Compliance with the A-76 Circular will be a huge job, and will require much staff time. Performance, at least initially, will have to be a Commandant function. The details of who and how are not yet determined, but the current intent is to avoid interfering with action required in the field for normal operations. There will, therefore, be two major aspects to Coast Guard compliance with the circular: A commandant directed program to develop the required inventories, perform the analyses; and, action taken by program/support managers in the field to comply with the circular while reviewing or changing facilities or services in the normal conduct of planning and operations. For telecommunications, this will include compliance with "new starts" and when replacing existing systems. We, as support managers, obviously cannot

cease all operations and actions while awaiting direction from the Commandant. But we also cannot ignore the circular. As the Commandant's program is formulated and executed, it will affect the course of our actions and the two major aspects will eventually merge. In general, all telecommunications services will be listed on one of the inventories, and scheduled for review unless waived in accordance with the circular and COMDTNOTE 4200. For telecommunications facilities, District Commanders and Commanding Officers of Headquarters units can assume the following procedures until motified otherwise or until an analysis is initiated by the Commandant:

a. Systems that are now under contract or leased in accordance with local telephone company tarriff may remain unaffected.

b. Replacement of any system with a system (owned or leased) with contract installation, maintenance, and operation may proceed without an A-76 analysis (but procurement must be done IAW competitive procurement regulations) if it is not considered feasible to perform the function in-house due to inability to obtain additional personnel resources required through the budget process, or reprogramming of personnel for such a function would be a very low priority if commercial service were available.

c. Replacement of any system (owned or leased) with a Coast Guard installed, maintained, and/or operated system

must be supported by an A-76 analysis unless the system qualifies for waiver under the provisions of the circular and COMDTNOTE 4200 dtd 28 Jan 80. Any waiver claimed must be fully documented with valid criteria. A simple statement such as "Coast Guard maintenance is required to guarantee response time" is not sufficient. Note that this applies to a "replacement in kind", even though Commandant operational approval is not required. The fact that the maintenance system now supports a system is not adequate justification to ignore the requirements of the A-76 circular.

d. New requirements may be met by competitive procurement without doing an A-76 analysis, if it is not considered feasible to perform the function in-house for the same reasons listed in 2.b. above. Any "new start" using Coast Guard installation, maintenance, or operation must be supported by an A-76 analysis unless the system qualifies for waiver under the provisions of the circular.

e. The operation of major telecommunications centers, such as in groups and district offices, and Communications and Radio Stations are to be categorized as qualifying for waiver due to National defense reasons. This does not mean, though, that all support functions, such as maintenance of facilities or equipment and operation of messes, will automatically qualify for waiver. They will not.

III. OFFICE OF TELECOMMUNICATIONS POLICY (OPT)/OFFICE OF MANAGEMENT AND BUDGET (OMB)

1. OTP Circular No. 13 dated 21 June 1979 remains in force under the authority of OMB, as directed by OMB Bulletin No. 78-15 dated 30 June 1978. It is a policy document which clarifies the role of the Federal Government as a user, rather than a provider, of telecommunications services. It is related to, and references, OMB Circular A-76, which existed at that time in a preliminary form.

2. The circular states that procuring a service is preferable to procuring a facility to provide a service. The distinction is sometimes difficult to determine, and often, procuring a service to meet a particular need requires procuring equipment or facilities. In attempting to define facilities, the circular uses the term "functions normally associated with providing the service" to demonstrate the actions that are to be avoided. Those functions include design, engineering, system management and operation, maintenance and logistical support. Note that actual ownership of items of equipment is not mentioned. The functions listed are not to be performed by the government unless the commercial service is:

a. not available during the time needed.

b. not adequate from a technical or operational standpoint, or

c. significantly more costly.

3. Interpretation of these provisions is sometimes difficult for an agency with the diverse needs of the Coast Guard. Many of our systems require unusual specifications or criteria that cannot be merely ordered from a vendor but require considerable in-house engineering work in design prior to beginning the procurement process. Since we seldom specify exactly how the vendor is to provide the service, we are in compliance with the circular, even though we may procure what may be called "facilities".

IV. GENERAL SERVICES ADMINISTRATION (GSA) REGULATIONS

There are three categories of GSA regulations of interest here; they are discussed separately:

1. The Federal Procurement Regulations (FPR) issued by GSA apply to telecommunications. They are too numerous and complicated to discuss in detail here; you should rely heavily on your contracting officer or procurement specialist for advice. However, anyone involved with a telecommunications procurement should have a basic understanding of the regulations so he or she will at least be able to ask the proper questions. A good source of a general understanding are courses and seminars put on by the Office of Personnel Management (formerly the Civil Service Commission). There are many important topics, such as: Differences between a Invitation for Bids (IFB) and Request for Quotations (RFQ); negotiation; unsolicited proposals; limitations on your dealings with prospective contractors; how to ensure compliance; etc.

2. Federal Property Management Regulations (FPMR) Part 101-37: Telecommunications Management. FPMR 101-37 contains general information and policy on telecommunications management, the Federal Telecommunications Systems (FTS), procurement authority, etc. All communications management personnel should be intimately familiar with FPMR 101-37. Two parts deserve special note here:

a. Subpart 101-37.308 contains framework of policy for various common user equipment and special purpose lines. In some circumstances, the standards may be unresponsive to the needs of the user. The best example is the prohibition against touch tone service. Often, the use of touch tone to access advanced system features will allow elimination of costly key equipment. The added cost of touch tone is minor compared to the potential savings, so the prohibition is counter productive. Note, however, that subpart 101-37.307-2 allows deviation from the standards of 101-37.308 "where the head of an agency, or his authorized designee, determines in writing that deviation is essential to the effective execution of agency responsibilities or is required by operational needs". If you have a valid need to deviate from the standards, such as to take advantage of cost savings available with touch tone, you should document that need and claim that deviation is necessary. In the case of an operations center with unusual needs, those needs should be documented and claimed for operational purposes. In practice, GSA will either approve

or not interfere with such installations if the justification is valid and clearly stated. In the example of touch tone service cited above, a valid cost analysis will speak for itself, and GSA has no reason to object. Local arrangements should be made to define who the "head of an agency or his authorized designee" is. The Coast Guard Telecommunications Manual, COMDTINST M2000.3, delegates management of voice and landline systems to district commanders and commanding officers of headquarters units. If there is doubt that the telecommunications manager is the authorized designee, it should be clarifed in writing by the district commander or commanding officer.

b. Subpart 101-37.200 requires agencies to obtain GSA approval for major changes to telecommunications facilities. This process is called obtaining Delegated Procurement Authority (DPA), and, though confusing, is mostly self explanatory. Section 201-1 and 201-2 discuss the procedures and refer to the section which provides definitions, etc.; Section 203 specifies what justification is required for approval. A couple of important points:

1. The table of information referenced by section 203 was prepared before competitive procurement became a common and available option for telecommunications. Consequently, it is geared to quoting tarriffed rates for a proposed change. In a competitive procurement, the costs aren't known until bids are evaluated, but obtaining the DPA should

not wait for availability of these cost figures because of the possible delay to the procurement process. GSA recognizes that the table is obsolete, and will grant DPA if sufficient information is provided to demonstrate that the Coast Guard has considered all relavent factors and the project is justified. Important factors to address in the request for DPA:

- what economic factors are known, or what estimates are available
- information on the number of attendants or operating personnel now required and to be required for the new system
- what are the specific problems and operational reasons for the change
- what options are being considered, and what advantages and disadvantages are seen to each
- that Coast Guard will coordinate with GSA at local level to insure network compatability, etc.
- that any further information desired by GSA will be provided when available.

2. There is no specific form or format for requesting DPA; a normal letter format is sufficient. When granting a DPA for a telephone system, GSA will provide a package called "FTS Network Compatibility Guidelines and Questionaire", which must be completed and returned to GSA before any FTS circuit changes can be completed (including simple re-connecting FTS trunks to a new switchboard). This package provides definitions

and discussions on the different types of FTS trunks and how they operate, and asks many detailed questions about the switchboard to be installed. The purpose is to insure that all the required planning and engineering required to insure that the trunks and new switchboard are compatible is performed early enough to assure a smooth and timely transition. It is normally best to have the equipment vendor fill out the questionaire, since he will be more familiar with the technical details of the system he is providing. GSA normally needs to have the questionaire in hand at least 60-90 days before cutover to have the time needed to work out the details of the circuits with AT&T and the local operating company.

3. Some GSA Regions will process DPA requests themselves, others will either just send them on to their headquarters or tell agencies to do so. As GSA headquarters delegates more responsibility to its Regions, local processing will become the rule. Your local GSA representative should be able to advise you; if not, Commandant (G-OTM) will help.

3. Federal Procurement Regulations Temporary Regulation 51, dated July 3, 1979 (expires August 17, 1981). In past years, it was normal practice for Government procurement of telecommunications service to order directly from tarriffed telephone companies. With growth of competition in the industry, it became necessary to require competition in Government telecommunications procurements. Temporary Regulation 51

requires Federal agencies to "obtain competition to the extent that it is available and to the maximum extent practicable in all telecommunication acquisitions". It also provides information and guidance on the roles of GSA and the user agency. Anyone involved in a procurement should be familiar with Temporary Regulation 51.

V. U. S. COAST GUARD

There are basically four categories of Coast Guard regulations, or directives, which apply to telecommunications procurements:

1. Contracting: CG-407, Manual of Procurement Procedures, implements the Federal Procurement Regulations (FPR) and Department of Transportation Procurement Regulations (DOT PR). It also provides uniform policies and procedures to clarify and supplement the FPRs and DOT PRs. CG-407 is supplemented by the 4200 series of Commandant Instructions. Anyone involved with procurement of telecommunications services should be aware of and basically familiar with these publications, but a non contracting specialist should not attempt to become an expert in the subject. Specific questions or problems with contracting should be immediately referred to a contracting officer, whose job it is to be an expert. Being familiar with those references will, however, provide familiarity with the terms and complexities of the contracting process and help avoid problems.

2. Budgetary: CG-255, Manual of Budgetary Administration, CG-264, Comptroller Manual, and the 7000 series of Commandant Instructions, provide information on the development and execution of budgets. COMDTINST M16010.1, Coast Guard Planning and Programming Manual, also contains information on budgeting and funding. The comments from 1. above generally apply to these also, but anyone involved in telecommunications management must be very familiar with the budgetory process, including, but not limited to: The RCP process; OE vs AC&I funding; differences between operating guides; and how to justify and obtain money in a competitive environment. See Chapter VII of this guide. The ability to properly and effectively manage money is one of the cornerstones of effective management.

3. Telecommunications Management: COMDTINST M2000.3, Coast Guard Telecommunications Manual, provides general policy guidance to management, operation, and procurement of telecommunications services. It delegates to District Commanders and Commanding Officers of Headquarters Units operational approval authority for telephone, landline, and terminal systems, and places responsibility for management of those systems on the District or Headquarters unit commanders. This authority does not negate the requirement for compliance with other directives, such as OMB Circular A-76 and the Federal Procurement Regulations.

4. Engineering: CG-165, Coast Guard Electronics Engineering Manual, provides guidance of obtaining engineering approval for projects involving electronics equipment. It also provides for compliance with various engineering standards, such as those promulgated by the Navy, FCC, or EIA.

VI. STEPS IN PROCURING TELEPHONE SERVICE/SYSTEMS

Most of the following is geared to telephone systems, but is equally applicable to other Telecommunications Services. The major difference is in the type of criteria used to define requirements and measure performance. Telephone systems, in general, are described in terms of operational functions performed, but specialized systems may require rigid engineering criteria. For example, the specification for a radar relay link for a VTS system may require very detailed signal characteristics that would not be necessary for a telephone system. Also, the steps here assume replacement of an existing system. For a new requirement, just ignore that which is not appropriate. Suggested steps in determining and evaluating alternatives for a Telephone system procurement:

1. The first step is to recognize the need for a change. This should be done formally, by preparing a written description of why a change is seen to be necessary. Subjective descriptions are useful, but objective lists and explanations of symptoms are what you must use to base action. Be careful

to separate symptons, problems, and assumptions. For example, listing "System costs too much" as a problem may be misleading. That may only be an assumption; compared to other systems the cost may really be very reasonable. High cost, though is usually a sympton, not an assumption or a problem. For example, if high cost is due to mileage charges, the cause of the mileage charge is the real problem. Note that the worst assumption you can make is that you have to take a specific action to correct the problem. If you make that assumption, you automatically ignore all other options, one or more of which may be just what you need.

2. Next, you should thoroughly examine the existing system to see if minor changes or modifications will eliminate or alleviate the symptoms or problems. Often "cleaning up" a key system that has grown out of control will save a great deal of money and streamline operation. On many systems (such as the common Bell 701 switchboard), addition of more line finders and connectors will clear up "no dial tone" problems. A common problem that is hard to deal with is where offices have too many lines on a key system. They are often unwilling to give any up. The use of a mechanical traffic register is a big help in demonstrating low usage of lines, and eases efforts to remove them. Lack of user understanding or user misuse can be the cause of severe problems. Perhaps an education campaign will help. If you are currently on a common user system and want to get off of it due to poor service

or poor response from the agency managing the system, don't jump too quickly. Carefully consider the benefits of the common user system (such as GSA's management and billing services) and the costs that will remain once you leave the system. If you are dissatisfied with the service and/or response by vendor or the agency managing the system, often a better working relationship will help. Remember that it is difficult to respond to non-specific complaints; follow up complaints to find out what the person at the other end thinks and what information he needs to help you. If you have trouble in getting his attention, get upper management involved. A brief comment or letter from the District Commander or Chief of Staff to the regional head of an agency can have surprising results. On the other hand, praise for any good response (especially at the high level) is the most powerful tool that you have, and strongly re-inforces that behavior. If you do not get a response after honest attempts, by all means proceed. But be honest in your statement of problems; lack of response by a provider agency to the needs of your agency, if you can document it, is a valid reason to seek an alternative solution.

3. If GSA has a common-user system in the area, or another agency close by has a system large enough to serve you, you should investigate using it. It is often easy to implement, and may have some side benefits, such as GSA handling billing and actual service ordering and procurement. Don't ignore

the value of bill processing by GSA; they can do a lot that you would find difficult to do without your own Call Detail Recording System or contracting for computer services. Another large benefit is the ease in which you can "join" a common user system. If an economic analysis proves favorable, the change can usually be made on a sole source basis, which saves a great deal of trouble. If you are aware of a common user system, but the agency providing it is not responsive to your inquiries, an informal approach to the vendor providing the service may help. He should be able to provide cost and advise of the feasibility, and may be able to suggest to the agency from his direction.

4. If replacing the system is necessary, you have several alternatives, all of which should be carefully considered. Procurement of the system and of maintenance service or installation (procurement does not mean "buy"; it means "obtain", and can be buy, lease, etc.) do not have to be done together, though they usually are. Options for procurement of the system include: Coast Guard design and construction (not usually a serious consideration); purchase off GSA schedule; Purchase sole source (very difficult to justify); purchase by competitive procurement; lease by competitive procurement; and lease with option to buy by competitive procurement. Options for procurement of installation and maintenance include: Coast Guard performance (must be supported by A-76 analysis); sole source (difficult to justify); and contract performance.

Note that merely accepting tarriffed service from the local telephone company is a sole source procurement. The above options give many combinations; here is a discussion of the most common to consider:

a. Coast Guard purchase from GSA schedule and provide installation and maintenance in-house. This is an attractive option in many areas, particularly at Groups and stations where technical support is already present. It is must less attractive at large facilities due to the need for the Coast Guard to create a "mini telephone company" to handle all the moves, service changes, and administrative record keeping. The provisions of OMB Circular A-76 apply, unless the activity qualifies for a waiver. Except in unusual circumstances, compliance with FPMR 101-37 is required, since telephone systems are not normally considered to fall under the exemption the Coast Guard claims for operational circuits and systems.

b. Acceptance of tariffed service from the telephone company: This is a sole source procurement, and would have to be justified as such. Procurement regulations require competition. See GSA Temporary Regulation 51, which strengthens existing policy in this matter.

c. Competitive procurement of equipment, installation, and maintenance. Requires the careful preparation of a procurement document. The "Standard" specification provided with this guide should serve as a good start, but it will have to be

tailored to the specific need. A contracting officer should be consulted early in this process. The decision as to lease vs. buy is made on the basis of life cycle costing techniques, not an A-76 analysis.

d. Coast Guard buy equipment from GSA schedule, contract for installation and maintenance: This may be an attractive option, since it makes it easier to obtain the specific system you desire. The major drawback is that the installation and maintenance contractor is not responsible for problems due to improper equipment supplied. It may be difficult to resolve disagreements on that issue.

e. Competitive procurement, contract installation and maintenance for first year (or more), Coast Guard assume maintenance: This is an attractive option in many circumstances. Private industry uses this approach often, as have government agencies. An advantage is that the first year of maintenance is usually included in the procurement cost of a system, so you don't waste your personnel while the system is on warranty. Also, you don't have to worry about maintenance until the bugs are worked out, and your technicians would have a year to get to know the system. The disadvantage is that assumption of maintenance would be a conversion from contract to in-house performance, thus subject to OMB Circular A-76.

VII. FUNDING STRATEGIES

Funding, of course, is one of the most important aspects of any project. Funding is a mystery to many people, but should not be. Planning and budgeting are a vital part of a communicator's job. The Telecommunications Manual, COMDTINST M2000.3, contains a chapter on planning and budgeting for telecommunications. Anyone working on procurement of a telecommunications system should be familiar with that, the Planning and Programming Manual (COMDTINST M16101.1), and the Manual of Budgetary Administration (CG-255). With those as background, here are several strategies that can be employed in attempting to obtain funding. Some situations lend themselves to several strategies simultaneously (for a "shotgun" approach), some to only one or two. Remember that as in all funding efforts, the strongest ploy is billet reductions; if billets can be given up, money is easier to get.

Strategies

1. OE (Operating Expense) RCP (Resource Change Proposal). This is a basic source of OE funding for the Coast Guard, and is described in the Planning and Programming Manual. If successful, and RCP (if submitted by deadline date) will produce funds three years from submission. The biggest problem with RCP funding for a telecommunications project is that the final costs and dollar benefits are not always known. However, if estimates can be made, the RCP can be updated later. Competition for RCP funding is fierce, so all factors must be

presented clearly, concisely, and strongly. The prime benefit of an RCP is that if successful, a specific funding source is obtained, rather than requiring reprogramming of existing resources. This is particularly important if recurring support is required. RCPs are prepared only by headquarters program and support managers, so you must provide Commandant (G-OTM) with sufficient information to draft the RCP. The normal vehicle for this is via a planning proposal, which is described in the Planning and Programming Manual.

2. AC&I (Acquisition, Construction, and Improvement). Procurement of large telecommunications systems are candidates for AC&I funding. The general rule is that items costing greater that $75K should be AC&I, but the application of that rule to electronic systems is not clearly defined. Effort is now underway to better state the rules. See the Planning and Programming Manual and the Comptroller Manual for details. Most of the comments of OE RCPs in paragraph 1. apply, since AC&I funding is generated by AC&I RCPs. However, AC&I funding requires submission of special documents. AC&I can provide follow-on funding support.

3. Minor AC&I: Projects costing between $75K and $300K may qualify for minor AC&I funding, which is described in the Planning and Programming Manual. The minor AC&I program is designed to ease the paperwork and delay involved in normal AC&I projects when the project is relatively small

(by AC&I standards), is urgent, can be executed quickly, and/or has a high payback. Telecommunications projects often meet all of these criteria. The minor AC&I program will provide funds two years from the year of submission if the request is successful. Like OE and AC&I RCPs, the competition is fierce. Note that the minor AC&I program will not produce additional recurring support funds.

4. OG42 Planned Operational Procurement (POP) List. Each year's OG42 funding is composed of two elements: Recurring "base" of OG42 funds for supporting all program and mission area needs, and; incremental increases or decreases to meet planned program needs (funding normally provided by OE or AC&I RCPs). Accordingly, OG42 as a whole is flexible and may be applied to telecommunications projects without successful RCP or AC&I funding. A portion of the total yearly OG42 is distributed to District Commanders and Headquarters Units to manage, while the majority is retained at Headquarters for the "new", "replacement", or "maintenance" portions of the POP. However, it is becoming increasingly apparent that the OG42 "base" (and POP) is inadequate to provide for all the "new" and "replacement" projects desired by program managers. Consequently, projects for POP funding will be carefully scrutinized, and the competition will be stiff. Good justification and/or payback will strongly help. Normally, projects costing greater than $50K or are of Coast Guard wide nature will be considered for POP funding, though

this rule is informal and "flexibly applied". OG42 is not appropriate for lease of telephone equipment, but may be used for purchase and/or installation. The OG42 POP list does not provide any recurring support funds.

5. District/HQ Unit OG42 allocation. District Commanders or Commanding Officers of Headquarters units have great freedom in the management of their OG42 allocation, provided intended projects have appropriate operational and engineering approval. Unless the Commandant provides a specifically identified increment to a field OG42 distribution, large projects (over $50K) may not be appropriate due to the effect of the one project on the overall OG42 funding level of the District or HQ unit. Projects under $50K should normally be funded by the District or HQ unit. OG42 is not appropriate for lease of telephone equipment, but may be used for purchase and/or installation. District OG42 also does not provide recurring support.

6. Reprogramming of Funds. If the operational requirement is urgent and/or the payback is large, funds may be provided by re-programming at the Headquarters, District, or unit level. This is usually accomplished in response to a well justified planning document (such as Planning Proposal), but support managers may also get involved in response to less formal planning documents. Evidence of prior attempts to properly seek funds is helpful, as well as positive identification of cost offsets (if any) that will be offered in

exchange for re-programming. Re-programming may provide recurring funds, but this should be verified carefully in advance.

7. Use Savings. Often the direct OG30 budget savings to the unit involved will pay most, if not all, initial start up costs if a lease option is executed. This approach is highly sensitive to timing, since a change at the first of the fiscal year will generate maximum savings available that year for use, while a change at the end of the fiscal year will generate little or no useful savings for that year. A slip in execution time may drastically affect the cost picture for the project. Use of savings in this manner may require re-apportionment of quarterly allocations, but that is a trivial matter if planned in advance. The fact that there are savings implies there is no need for additional follow-on support.

8. Fallout funds. Each year, some level of funding becomes available in the final weeks or days of the fiscal year. This is caused by unexpected delays in the ability to obligate funds (such as contract delays, technical problems, etc.), and sometimes poor management on the part of some funds managers. Worthy projects are identified in advance at various levels to quickly utilize fallout funds when they are made available. To be eligible for such funding, a project must be complete to the point of contract issuance, and must be of the sort that funds can be obligated in a very short time frame. This means that the contractor's offered

price must be current. This approach is not the best unless it is merely to take advantage of an opportunity and free up subsequent year funds. It should not be relied upon as the sole funding source for a project. It is, however, a very useful approach to speed up a project and free up funds later. Fallout funds approach do not provide recurring support unless the project generates savings.

VIII. SAMPLE SPECIFICATION

1. The attached sample specification is intended to serve as a starting point for preparation of a procurement document for a competitive procurement. Ideally, users could merely "fill in the blanks" and put it on the street (with the required contracting "boiler plate"), but procurements are not likely to be that easy. The needs of every location are different, and require very careful fine-tuning of the procurement document to tailer it to the specific needs of that location. A great deal of care should be given to insuring that the requirements are not more stringent than necessary, but also are sufficiently detailed to keep the Coast Guard in control of the process. Luckily, most modern telephone systems will adaquately do the job; the keys to a successful system are proper installation, operation, maintenance, and use of features. A very good example is the section on Dual Tone Multi-Frequency (DTMF) versus rotary dialing equipment. (DTMF is generally known as "touchtone"). Modern Electronic

Private Automatic Branch Exchanges (EPABXs) are designed for DTMF; their feature activation is by dialing digits and special keys, whereas older systems either had no features or depended on costly electro-mechanical key telephone equipment. Use of rotary dialing on a modern system is a lot of work for both the user and the system making both operate inefficiently. There are other benefits of single line over key systems that are often overlooked:

a. Economy of scale: In an electronic system with single line configuration, user features are implemented mostly with common equipment and software located in the switch, rather than being spread throughout the facility in duplicative key systems.

b. Maintenance: In single line installations, maintenance is centralized in the switch, since instruments seldom fail and can be easily replaced if they do. With key systems, however, maintenance is spread all over the facility. This fact is not lost on the utilities, who have greatly increased key system tariffs in recent years due to large labor cost increases.

2. Conspicuously absent from this sample specification is a requirement for systems to be digital. Though digital is the wave of the future, and is highly touted, there are some practical considerations.

a. Requiring a switch to be digital would now severely restrict competition, since most are still analog. In fact,

such a requirement would eliminate the Bell system, since they do not yet have a digital customer premise switch. Eliminating the Bell system, despite many people's opinion of Ma Bell, would be a severe mistake, since they do offer a great deal of security not yet present throughout the interconnect industry.

b. At the present, digital switches are expensive; an expense you may not need.

c. There is a lot of talk about the benefits of going digital. Before blindly following, carefully evaluate the value of those benefits to your situation. Most of us are after high quality, cost effective telephone service. If you expect an explosion of terminals and computers over your installation in the near future, you may benefit. Buy paying many thousands of dollars to avoid a few modems does not make sense. As someone famous once said: "Keep it simple, stupid!".

3. There are a few new approaches in this simple specification. The most important:

a. The treatment of rotary vs DTMF instruments is a significant departure from past government experience (mostly GSA). Most procurement documents describe the existing system, including key equipment, and base cost comparisions of proposals on duplicating the existing system. If the agency then wants to obtain a modern system, a changeover to single line DTMF is negotiated with the low bidder before installation. There are three major problems with this approach:

1. Conceptually, it makes little sense to base a procurement on specification of a system you know you don't want. This would leave you wide open to protest from losers in the competition, since you end up procuring a different product than that described in the specification upon which they based their offers.

2. You may very well end up not getting the best price available for what you end up with. In any case, you could not prove that you did get the best price.

3. A system based upon heavy use of key equipment may require a smaller switch than one based upon single line instruments, since in the latter, every station is a line on the switch (except extensions used by low volume users). Often, negotiating change to a single line configuration results in eating up most or all of the planned growth capacity. Several procurements of this sort have maxed out the system immediately; resulting in poor service, no flexibility, and retrofitting to key systems.

b. Reference to, and requirement for compliance with, the new Electronics Industries Association (EIA) Standard RS-464 dealing with PBX interfaces. Reliance on this standard will make procurement easier. Also, industry is expected to come into voluntary compliance (they are who wrote the standard for EIA), making interface problems much less severe in the future. The new standard is not yet fully integrated into this sample specification; it will be as experience with it is gained.

c. The specification is organized into functional categories in an attempt to make it easier to follow. This is an improvement over typical specifications, which have tended to grow as a hodgepodge.

4. Several aspects of this document need more work, which will be done as time and experience permit. Specifically:

a. Improved reliance upon, and reference to, EIA Standard RS-464 and additional standards proposed by EIA for PBX systems. As these standards become familiar and in common use, the volume and complexity of procurement specification should decrease significally.

b. The section in the specification on optional features is now blank. The required features are what are seen to be the minimum necessary now to insure a modern, responsive system. Other features that are available (many of them come with the systems whether you require them or not) are beneficial and nice to have. If specific ones are seen to be of interest in a particular procurement, they should be addressed in this section. Several will probably be appropriate for inclusion in the sample specification, particularly Call Detail Recording, Automative Identification of Outword Dialing (AIOD), Automatic Message Accouting (AMA), or other related systems that produce management reports and tailored billing on the use of telecommunications facilities.

c. The specification should still be shortened some; more effort will make it more concise and clear.

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PART V - SPECIFICATIONS

1. Scope

a. These specifications cover the furnishing, engineering, installation, and maintenance of a complete operational in-service electronic automatic Private Branch Exchange (EPABX) system/equipment to be referred to herein as the "system". In addition to the basic switching equipment, the system includes subscriber station equipment, attendant cabinets/consoles, house cable, and exterior cable plant, as well as anciliary equipment, as defined in Table I and Attachment No. 2 to provide on-premise and off-premise telephone service to _____ _____.

b. The offeror has the option of proposing an on-customer premise or off-customer premise system. Should the offeror elect to propose an on-customer premise system, the system's switching equipment will be installed at _____. Drawings of the building can be obtained by contacting the contracting officer. Drawings will also be available at the pre-proposal conference. Off customer premise proposals must identify all mileage costs that will apply.

c. The contractor shall be responsible for providing switching equipment quantities identified for the system at cutover and, as needed, those facilities required for growth, as detailed in Table 1 and for day-to-day operation. System expansion shall be accomplished with minimum interruption to existing service. The offered system shall be expandable as shown in Table 1.

d. The system shall provide local intrasystem telephone service (station-station calling), access to and from the local telephone company's message network, access to and from the Federal Telecommunications System (FTS) network, and be capable of providing either dial pulse or Dual Tone Multi-Frequency (DTMF) signalling to the central office, whichever is required for interface to the local telephone company.

e. The contractor shall be solely responsible for compatibility of the offered system/equipment with any and all circuits and facilities as provided by the local telephone company or other providers of service to meet the service requirements of these specifications.

f. The contractor shall perform as an agent of the U.S. Coast Guard and shall be responsible for coordination with the local telephone company where equipment malfunctions are identified by the contractor to be in the equipment provided by the telephone company, such as cable pairs, Central Office (CO) trunks, interconnect arrangements, etc. It shall be the contractor's responsibility to notify the local telephone company of such circuit/equipment malfunction and assist as necessary for timely restorations of faulty circuitry/equipment to service.

g. Each offer shall include the cost of follow-on services listed in section 2.9 of this specification, and the following:

(1) Main station installation, removal, and relocation.

(2) Extension station installation, removal and relocation.

(3) Telephone instrument (multiline, single line) installation, removal and relocation.

(4) Installation, removal and replacement of lights and other multiline instrument features.

(5) Installation of Central Office trunk terminals, tieline terminals, FTS access lines, and all other related systems switching equipment and interfaces.

(6) Augmentation of switching equipment and console components as necessary for system expansion to meet growth requirements and/or to maintain the specified grade of service.

(7) Preventive and remedial maintenance.

(8) Traffic and usage studies.

(9) Maintenance of line record cards, house cable records, feature assignment records, systems test records, trouble report records, measurement and performance data.

(10) Engineering and consulting services in support of the system acquired through this RFP when formally requested by the Government.

2. System Requirements

2.1 General System Requirements

a. The proposed system and ancillary equipment offered shall provide a fully automatic telephone switching system arranged for station-to-station calling and shall:

(1) Be compatible with the Federal Telecommunications System (FTS), a Common Control Switching Arrangement (CCSA) private line network that provides switched telephone service for the Federal Government. FTS circuits are arranged as: Access lines homed directly to a network switch; dial-repeating tielines that tandem through a primary PBX, and station-to-trunk tielines that terminate as main line stations on a primary PBX. At the present time, _____FTS trunks are configured as _____. Incoming and outgoing calls are normally dialed direct without the aid of an attendant (NIOD).

(2) Be compatible with the local message network for Direct Inward Dialing (DID) and Direct Outward Dialing (DOD).

(3) Be capable of both operator control and station user dial access to WATS and Foreign Exchange lines, to be selected by the Coast Guard in the future if these services are added.

(4) Allow station to trunk (tie line, etc.), trunk to trunk, and trunk to station dialing without the aid of the attendant.

(5) Provide service features, as identified elsewhere herein, to meet the service requirements of this specification.

b. The contractor shall be responsible for compatibility of the proposed system numbering scheme with the numbering plan for the FTS and local message networks. The current in-dial FTS numbering plan for _____ is _____. The numbering system from the local message network is _____. The contractor shall consult with the telephone company and GSA regarding any current or future plans to change the FTS numbering plan, to identify the FTS listed number and to identify the future numbering plan for in-dial from the local message network. The numbering plan for the proposed system shall include one, two,

and/or three-digit access codes for user access to central office trunks, FTS access lines, the attendant (if any), tie lines, and when or if required, WATS and FX lines. The following access codes are mandatory:

(0) Operator or attendant (information and other requests for assistance).

(9) Central office trunks (direct-out-dial).

(8) FTS (direct-out-dial).

Access codes to other trunks/tieline groups shall be at the discretion of the contractor within the limits stated above. When access codes are dialed by the station user, and after seizure of a trunk or tie-line circuit, the calling party shall have direct control of the circuit, with the capability of sending additional digits, unless the station line is restricted by its class of service assignment.

c. Complete flexibility shall be provided in the system for cross-connecting any equipped station number to any equipped station line equipment.

d. When the trunk circuits, tielines, access lines, and/or main station lines extend outside the building housing the switching system, such circuits and lines shall be provided adequate protection at the distributing frame against electrical surges and crosses, where such surges or crosses may be damaging to the telephone switching equipment or present a hazard to operating personnel. All protection devices, switch frames, and power busbars shall be grounded in accordance with industry standards for the type of telephone system offered.

e. A sufficient number of line terminations and station number equipment when required shall be provided in addition to the quantity specified in Table 1 for subscriber line service to meet the requirements of the system for equipment testing, alarm checking, tone transfer, and other required special features required for contractor maintenance,

f. All telephone numbers within the system shall be capable of both station hunting and individual number selection. The assignment of station hunting numbers shall be made by the Government at the time numbers are assigned, and may change periodically. Stations assigned to hunting groups will not necessarily be in number sequence.

g. The system shall provide sufficient cross-office switching and voice channels between lines and trunks to provide as a minimum the grade of service during the office busy hours as follows: (see Table 2 for detailed Traffic Data)

Type of Connection	Grade of Service Required
Terminating calls (Trunk-to-subscriber or trunk-to-trunk)	P.01
Originating calls (Subscriber-to-trunk)	P.01 (after dial tone)
Intraoffice calls (Subscriber-to-Subscriber)	P.01 (after dial tone)
Dial tone connection (Subscriber-to-dial tone source)	Not more than 1.5 percent busy-hour calls delayed over three seconds.

h. The installation shall be a fully integrated system of trunks, switching apparatus, telephone instruments, and cable, conforming to acceptable industry standards.

i. The contractor shall identify in the proposal the voltage, phase, frequency, and amperage of the commercial a.c. power source required for the system and the number, location, and capacity of a.c. circuit outlets required.

j. The contractor shall include in his proposal all environmental heating and cooling specification requirements to house the telephone system including dimension, floor loading, and weight of all equipment racks and frames. Ceiling height within the propoxed equipment room is _____.

k. The contractor shall provide in his proposal the names and addresses of customers with similar systems already installed so that the Coast Guard may visit one or more of the installation, prior to contract award, to see the system and discuss its operation and maintenance with the user. Systems demonstrated in accordance with this requirement must include one or more with extensive outside cable plant installations (by extensive is meant multiple underground cables between buildings, with splices as required).

Offerer must be able to show a demonstrated ability to install and maintain outside cable plant with personnel experienced in outside plant.

1. The contractor shall provide a system using new, unused equipment that incorporates the latest design which is in current production either by the contractor or other suppliers.

m. Internally, the system will be designed for single line, DTMF signalling, access to user features and dialing, though some key telephones and/or rotary instruments may be required. See discussion in section 2.3.a for relationship between rotary/DTMF dialing and multi/single-line instruments.

n. Circuit terminations associated with the system shall be engineered to comply with Electronic Industries Association (EIA) Standards RS-464.

o. The contractor shall provide in the proposal a block diagram showing the general concept and configuration of the system proposed.

p. The system shall provide for, and be designed to, intercept all vacant service codes, unassigned subscriber numbers, and discontinued subscriber numbers by the system attendant or a recorded announcement. Where a single intercept device services the entire system, an alternate device shall be provided.

q. Night Service Arrangements.

(1) A night answering capability shall be provided in order that incoming calls to the attendant position(s), when the position(s) is in the night mode, can be answered from other selected numbers within the system. Universal night answer (or trunk answer from any station) is acceptable.

(2) When universal night answer is provided, chimes to announce incoming calls shall be strategically placed in a minimum of two locations in the _____. These chimes shall not ring when the attendant console is in operation. These chimes shall be located at _____.

r. Line number assignments, feature assignments, and class of service for all lines shall be changable by the attendant or Communications Officer at no per-change

cost by use of the attendant console, a remote terminal, a user service terminal, or other such device located on the premises. Proposals shall specify allowable locations and precedures required to perform these changes.

2.2 Cable

a. Contractor-Furnished Cable and Wire. All cable and wire furnished and installed by the contractor shall be designed with suitable cross-section to provide safe current-carrying capacity and mechanical strength for the purpose for which it is to be used. Adequate precautionary measures shall be taken by the contractor to prevent cross-talk or other inducted interference in the cable. Cables and cable terminals provided and installed by the contractor shall be equal to or better than the quality, design, construction, and performance of those normally provided by the local telephone company for the particular locations. All cable and wire installed by the contractor shall be in accordance with all local regulations governing such installations.

b. Cable Distribution System

(1) The contractor has the option of using the existing cables and terminals or installing new cables and terminals. All proposals shall specify the option of the contractor. An inventory of existing cables and terminals including prices, as provided by _____, will be provided upon request.

(2) The cable and cable terminals where the proposed system is to be installed is the property of _____Telephone Company, hereinafter referred to _____. In the event of contract award to a private contractor, _____ has offered to sell such cables and terminals at a price of _____, which is fixed until date . In the event the contractor elects to procure and use the existing cable and terminals, the contractor shall consumate the procurement with _____. The contractor shall be responsible for coordination with _____ for the transfer of cable pairs from the telco equipment to the contractor provided equipment.

(3) If the contractor elects to install new cables and terminals, such cable and terminals shall be installed by the contractor in a professional manner with a minimum of 25 percent spare capacity available at each building floor for future expansion. The cable shall be enclosed in conduit where such conduit is available. In the event the conduit is full with existing cables, any new cables shall be installed in a temporary fashion, pending removal of the existing cables, or be installed in a manner equal to industry standards for a permanent installation. The telephone company, if other than the contractor, shall be responsible for the removal of all unused calbe and terminals from the building, subsequent to cutover of the system. The contractor shall be responsible for relocating any temporarily installed cables to the vacated conduit. All cables and wiring installed by the contractor shall be concealed as far as practicable and meet all local municipal and state codes applicable to such installations.

(4) The contractor may elect to use telephone company leased cable pair between building locations, in risers, and in floor distribution systems where this would result in a lower overall cost to the Government than buying existing cable or installing new cable. The proposal must identify each location, cable requirement, associated costs, and identify the interconnect arrangement applicable if required.

c. Cable Distribution Frame. A cable distribution frame shall be provided with the system which is capable of satisfying the initial requirements and be capable of expansion to satisfy requirements stated in Table 1, Part V. The cable distribution frame shall provide a means to cross-connect station equipment, cable pairs, and telephone company facilities to the proposed telephone system.

2.3 Station Equipment

a. Telephone Instruments. All station equipment interfaces shall comply with Electronics Industries Association (EIA) Standard RS-464.

(1) Telephone instruments, as required, shall be provided by the contractor. Such instruments shall be equal to, or better than, the quality,

design, construction, and performance of the telephones used by the local telephone company. All instruments must be installed as normally produced by the manufacturer; no modifications of instruments are allowed, such as installation of auxiliary keys, switches, etc. to implement user features. Multiline instruments shall be completely equipped with lamps, pickup and hold keys, and adjustable ringer to indicate station call, wink hold, and line busy. Included in Attachment No. 2 is a representative list of instrument types and quantities currently projected. The types and quantities of instruments change frequently, and will not necessarily be as listed in Table 1 and/or Attachment No. 2 at time of cutover. However, evaluation of all offers will be made on the types and quantities specified in Table 1. The contractor shall take this into consideration in preparing his proposal. Certain instrument types may be increased or decreased, added or deleted, or new types added as required at the time of installation and thereafter. Calculation of cost changes will be in accordance with unit prices contained in the proposal.

(2) Hard of hearing handsets must be available and interchangeable, when required, to replace the headsets of single and multiline instruments in the proposed system. Application must provide for amplified reception and amplified transmission or switch gain control if desired.

(3) The contractor shall be responsible for the design of station equipment plans subsequent to contract award in coordination with the Coast Guard Communications Officer. The actual quantity and type of telephone instruments shall be determined concurrently with station plan designs.

(4) The system, as detailed in table 1 and attachment no. 2., is designed to be primarily single line DTMF signalling instruments for access to user features and dialing. Exceptions:

(a) Due to operational or expected economic reasons, key telephone systems are required at locations indicated on attachment no. 2. For these installations, Rotary or DTMF instruments are acceptable. The Coast Guard

will evaluate proposals based on the least costly offered, but may elect DTMF despite a cost difference at the time of installation.

(b) Locations not requiring access to advanced user features needed in an office configuration are listed in attachment no. 2 as single line rotary instruments. The commands in the last two sentences of (a) above apply.

(5) Single line telephone instruments must be modular (Bell System or equal), with simple clip connect/disconnect between handset cord and handset, handset cord and instrument body, instrument body and body cord, and body cord and house cable connector. All cords must be commercially available with clip connectors installed by manufacturer.

(6) Nothing in this section shall be interpreted to exclude the use of "electronic key telephones" that combine the features of key and single line telephone on single or dual pair station lines.

b. Class of Service

(1) The system shall be equipped to provide, as a minimum, 4 originating classes of service to subscribers. Each class of service shall be available on all line circuits, with flexibility to permit class of service changes without requiring a station number change. Classes of service shall be available on a per station basis. Tie line and off premise extension users are to be treated as station users. The following minimum classes of service shall be available:

(a) Unrestricted access to all system features and trunks.

(b) Fully restricted, intra-system calling only (intra-system includes access to all tie line and off premise extensions, but not foreign exchange and WATS lines, if ever provided).

(c) Restricted from Dial "9" (both local and DDD), Foreign exchange (if provided) and WATS (if provided), but with access to all other system features and trunks.

(d) Restricted from dial "9" DDD only (allowed local calls), allowed access to all other system features and trunks.

(2) The class of service to be applicable to a particular line will be identified by the Government at the time line circuits and numbers are assigned to the users of the system, and may be charged from time to time.

(3) The class of service for all lines shall be changeable by the attendant or training center communications officer. See section 2.1.r.

c. Call Transfer. The system shall provide station call transfer (transfer without the aid of the attendant) within the system or intersystem, incoming and outgoing Central Office, FTS, WATS, and FX, trunk calls.

d. Station Hunting. Station hunting shall be provided on a per line basis for a minimum of _____ groups of 2 to _____ stations per group. Station numbers in hunting groups may not necessarily be in number sequence.

e. Call Forwarding (No Answer). Call forwarding shall be available to permit incoming calls that are not answered in a preset period of time to be automatically routed to another station (or to the attendant).

f. Consultation Hold. Consultation hold shall be available on all incoming and outgoing trunk and intersystem calls whereby any telephone has the capability of holding a call and on the same line dial another station for a private consultation and then return to the original call without the aid of the attendant.

g. Add-On-Conference. Add-on-conference shall be available on all incoming and outgoing trunk and intersystem calls whereby any telephone has the capability of holding a call and on the same line dial another station and establish a three-way conference without the aid of the attendant.

h. Call Pickup. System shall allow a station user within a call-pick-up group to dial a specified code and answer an incoming call for any other ringing station within the call-pickup group. The system shall provide this capability to office locations with more than one single line instrument.

2.4 Trunks. All trunk interfaces shall comply with Electronic Industries Association (EIA) Standard RS-464. The contractor is responsible for insuring his equipment is in compliance and is engineered to conform with the standards in RS-464 applicable to the local telephone company. Standards will only be waived where the contractor presents an analysis showing the standard cannot be met, what the effect of non-compliance will be, and that non-compliance will not adversely affect operation and maintenance of the system and the telephone company network.

a. CCSA Access Lines Network Inward-Outward Dial (NIOD)

(1) Access lines shall be provided in accordance with Table 1.

(2) The access lines will connect the proposed system to the FTS network at (telco name, central office location, type of system), via one access line group.

(3) The access lines shall be arranged for direct in-dial and direct out-dial (NIOD) whereby incoming and outgoing calls shall be routed automatically to and from the stations without attendant assistance.

(4) The attendant position will be a direct in-dial number (or numbers) to be specified at time of line assignment.

b. Central Office Trunks (Manual-in, DOD, DID, DIOD)

(1) Central office trunks shall be provided in accordance with Table 1. Proposals shall indicate the type (one-way or two-way) or combination of types of trunk circuits being offered to meet these requirements with associated costs.

(a) Direct out-dial (DOD) trunks shall be arranged for dial 9 access by unrestricted stations. These trunks shall be arranged for outgoing service only. Station access to local and toll network in accordance with stations assigned class service.

(b) Direct in-dial (DID) trunks shall be arranged for one-way incoming service only. All calls on these circuits shall be routed directly to the individual stations automatically without attendant assistance.

(c) Direct in-dial/out-dial (DIOD) trunks shall be arranged to provide two-way service so that incoming calls are routed directly to the individual stations without attendant assistance, and for direct access for outgoing calls from unrestricted stations by dialing 9. These trunks may be arranged to handle two-way traffic (incoming and outgoing). Station access to local and toll networks in accordance with stations assigned class of service.

(2) The attendant shall have the capability of extending an outgoing call originaged from a restricted station, and calls received via any incoming trunk, to any outgoing trunk. Incoming trunks shall not be capable of accessing trunks without attendant assistance, except as specified in paragraph 2.3.b.

c. Tielines

(1) Two-way dial repeating tielines shall be provided in accordance with Table 1.

(2) The tielines shall be arranged for direct in and out-dial whereby incoming and outgoing calls from unrestricted stations shall be routed directly to and from station numbers without the assistance of the attendant. The tielines shall have dial access to FTS and to outgoing Central Office trunks in accordance with their assigned class of service.

d. Tandem Tielines. System shall provide for tieline to access line connection through the switching with or without attendant assistance.

e. Wide Area Telephone Service (WATS). Terminations for WATS circuits if later installed shall be in accordance with paragraph 2.1.a(3) and Table 1, and shall be capable of access by the attendant and the stations by dialing an access code. Access by stations shall be controlled by the assigned class of service.

f. Foreign Exchange (FX). Terminations for FX circuits shall be provided in accordance with paragraph 2.1.a(3), Table 1 and shall be accessed by the attendant and the stations by dialing an access code. Access by stations shall be controlled by the assigned class or service.

2.5 System Physical Requirements

a. Power Requirements. Offeror shall specify voltage, current capacity, number and type of outlets, and phase, required for switching equipment and any ancillary equipment external to the main equipment cabinet.

(1) Battery Reserve

(a) The system shall be supplied with a battery reserve of two (2) peak busy hours (including telco interconnect devices, if any) based on the number of lines projected for the contract period. The batteries shall be designed to last a minimum of ten years when maintained on a full-float operation. The battery size shall be calculated in accordance with standard procedures for the switching equipment.

(b) Racks of suitable structure and design shall be provided to mount the batteries.

(2) Battery Chargers

(a) Battery charging device(s) shall be provided and shall provide power to operate the system on a full-float, uninterrupted service basis. The charging device(s) shall be equivalent to a full wave, self-regulating, constant-voltage, dry-disc type, and shall be capable of automatic parallel operation when two or more chargers are provided. The charging device(s) shall be capable of manually changing the output voltage to provide an equalization charge on the batteries.

(b) The charging device(s) shall be equipped to indicate a failure of charging current to the batteries, whether due to a.c. power failure, an internal failure in the charger(s), or to other circumstances which might cause the output voltage of the charger(s) to drop below the battery voltage. An alarm shall be provided to indicate a failure of the charger(s). A high and low voltage alarm shall be provided.

(3) Power Board

(a) Power boards and associated wiring shall be designed to handle the estimated initial and projected 10 year facility requirements.

(b) Battery and charger control switches, d.c. voltmeters, d.c. ammeters, fuses, circuit breakers, and supervisory and time circuits shall be provided as required.

b. Call Process Signals.

(1) Ringing Equipment

(a) Ringing device(s) shall be provided in accordance with requirements and design of the proposed system, shall comply with Electronics Industries Association (EIA) Standard RS-464, and shall be capable of satisfying the initial and ultimate projected system requirements.

(b) Ringing shall be completely automatic and shall stop during the ringing or the silent interval when the called station answers the incoming call.

(c) The ringing device(s) shall be equivalent to solid state design and operate from the d.c. power source. If trouble occurs in the ringing device(s) an alarm shall be given. Where one primary ringing device serves an entire system, the entire load shall be transferred to an alternate ringing source.

(2) Tone Equipment

(a) Tone-generating device(s) shall be provided equivalent to solid state design and operate from the d.c. power source. If trouble occurs in the tone device(s), an alarm shall be given. Where the primary tone device serves an entire system, the entire load shall be transferred to an alternate source.

(b) Tones shall be in accordance with the Bell System precise tone plan and the Electronics Industries Association (EIA) Standard RS-464.

Dial tones shall be provided to indicate that the switching equipment is ready to receive dial/tone pulses. Station busy tones (60 IPM) and fast busy tone (120 IPM) shall be provided to indicate that the switching equipment or trunk circuits are busy. Audible ringback tone shall be connected to the calling party to indicate that the called number is ringing.

c. Power Failure Transfer. In order to provide local emergency service during power failure, after the battery reserve has been depleted, arrangements for transfer of all circuits capable of providing proper signalling from and/or to telephone station/console equipment must be provided. The contractor shall identify associated costs, equipment, interconnect arrangements, and method of signalling for the individual circuits/groups.

d. Protection and Alarms

(1) The telephone system shall be completely wired and equipped with trouble signals and fuses. Visual and audible alarms indicating fuse operation and other circuit malfunctions resulting from component failure shall be provided. Audible alarms shall be provided with auto reset silencing capability.

(2) An alarm condition, additionally, shall be considered to be any system service interruption which precludes normal subscriber/station capability. This definition shall apply to all switch/trunk/line accesses, and shall be applicable to all critical or redundant switching circuitry/equipment. Contractor response to an alarm condition shall be in accordance with the emergency procedures detailed in Section 2.9.e.

(3) An alarm annunciator shall be remotely installed at _____.

(4) A howler circuit, or equivalent, to warn a subscriber that his receiver is erroneously off hook shall be provided. It shall place howler or equivalent tone on the line when the receiver is off the hook and institute line lockout. It shall remove howler or equivalent tone, and restore the line to normal when the receiver is replaced on-hook. The proposal shall indicate the off

hook time required to initiate the alarm. A minimum of 15 seconds and a maximum of 30 seconds is acceptable.

e. Test Facilities. The system shall be equipped with equipment or the capability to adequately perform maintenance and testing in this specification.

(1) Circuits and common equipment shall be provided with easy access to permit testing, determine if the equipment is functioning properly, and locate troubles during malfunctions. Common equipment and circuit terminal equipment shall be installed so that each item of equipment can be placed out of service for remedial and preventive maintenance.

(2) Mandatory Equipment

(a) The proposal shall include an itemized list of all mandatory test and maintenance equipment required on the premises to perform remedial and preventive maintenance testing, trouble shooting, and repair of the system including, but not limited to, testing of the common equipment, memory/software, circuits, stations, cable plant, power equipment, batteries, etc. The test and maintenance equipment should be stored in the switching equipment room.

(b) The proposal shall include itemized prices and recommended quantities for the mandatory test equipment recommended for on-premise storage. These costs shall be included in the lease or purchase price of system offered. The Government reserves the right to add or delete, at its option, items of equipment at the prices quoted in the proposal during the contract period.

(3) Optional Equipment

(a) The proposal shall include a list of optional test and maintenance equipment which is normally a part of the contractor's on premist maintenance facility responsible for maintaining the system including, but not limited to, printed circuit card testers, memory/software maintenance panels, portable equipment routiners, bench test, etc.

(b) The proposal shall include itemized prices and recommended quantities for the optional on premise test equipment. The base price of the proposed system shall not include prices for these items which the Government reserves the right to purchase, at its option, during the contract period at the prices included in the proposal.

f. Interconnect Arrangements

(1) Interconnect arrangements shall be identified by the contractor in his proposal when such arrangements are required by the local telephone company for the connection of customer-owned/supplied telephone equipment with that of the local telephone company.

(2) Interconnect arrangements and other local telephone company-provided support equipment located on site with the system that require external power for operation are required to have continuous power equivalent to that provided for the switching equipment. The contractor shall coordinate these support equipments and power requirements with the local telephone company and be responsible for those facilities necessary to provide the continuous power.

(3) The Government shall be responsible for ordering from the local telephone company the interconnect arrangements, as identified by the contractor in his proposal for any and all trunks, tie-lines, access lines, etc., for the initial system requirements and any subsequent requirement. Any interconnect arrangement(s) identified by the contractor in his proposal that is found to be in error, which has been ordered for which statement of charges has been issued by the local telephone company or AT&T shall be paid for by the contractor.

(4) The contractor, in coordination with the local telephone company and the Coast Guard shall establish the demarcation point or point of connection within the boundaries of the Coast Guard facility between the contractor-provided equipment and that which is provided by the local telephone company to satisfy system requirements.

(5) The switching equipment shall be designed and installed so that the system will be compatible with the commercial (DDD) and FTS networks, on a direct connection basis, should the mandatory use of telephone company provided interconnect arrangement be discontinued.

2.6 System Orientation and Training. The contractor shall provide to the Government on-site system orientation and training as follows. Cost, if any, shall be reflected in the cost schedules:

a. Initial Telecommunications Orientation. After the contractor has advised the Government that the system is installed and ready for use, and prior to cutover, the contractor shall conduct a two-day training session covering orientation for Government telecommunications management officials. The orientation, as a minimum, shall include an explanation of basic principles, theory and structure of the system, as well as demonstrations of equipment operations.

b. General User Training. The contractor shall conduct usage training sessions consuming approximately 40 hours total time using contractor personnel familiar with the system. Appropriate user flyers or manuals in a quantity of one (1) per telephone plus 10% shall by provided. The time and location of these sessions will be as mutually agreed upon by the Government and the contractor, but will be within one week after cutover.

c. Attendant Training. The contractor shall conduct on-site training sessions using qualified contractor personnel to train Government personnel in the operation of attendant positions as required, but not to exceed 40 hours. Appropriate manuals (not less than five) shall be furnished for this purpose by the contractor.

d. Engineering and Consulting Services. The contractor shall provide engineering and/or consulting services for the users of the system as may be required by the Government. These services may include assistance in meeting user requirements that require telecommunications equipment, station arrangements, attendant console training, user's seminars on system features, assistance in preparation of user's telephone directories or other requirements or services as may be required by the Government. The proposal shall include the hourly rate to be charged to provide these services.

2.7 System Drawings, Inspections, and Acceptance Tests

a. System Drawings

(1) Subsequent to contract award, but prior to start of system installation, the contractor shall provide the contracting officer with a detailed system design plan covering the proposed telephone system. As a minimum, the system design plan shall cover all common switching components, main station lines, circuirs, interconnect arrangements if provided, and attendant services.

(2) The contractor shall, as a minimum, have the following listed, updated "as built" drawings available on site for the proposed system following cutover of the system to service. These documents shall be stored in the telephone system equipment room and updated whan changes are made during the contract period.

Floor Plan	Show exact dimensions and location of each equipment frame or item to a convenient scale.
House Cable and Terminals	Show cable runs, pair assignments, and terminal locations.
Switching Diagrams	Schematic drawings showing the various equipment components in the system, their interconnection, and their identifying circuit number.
Equipment Layout Drawings	Drawings of major equipment items such as frames and shelves with the location of major component items of equipment shown therein.
Circuit Drawings	Individual schematic drawings and circuit description for each electrical circuit in the system, including one set marked to show wiring options in use.

Wiring Diagrams	Drawings indicating the specific method of wiring used on each item of equipment, and interconnection wiring between items of equipment.
Equipment Adjustment Sheets	Technical data sheets providing the pertinent information necessary to permit adjustment of any component part in the system which is normally field adjustable.
Job Drawings	Included in this category are drawings that are individual to the particular telephone switching system involved, such as main distributing frame, powerboard, testing facilities, house cable, distribution plans, etc.
Outside Plant	Plot plan of all cable runs, with conduits, access ports, manholes, location of splices, terminal locations, etc. indicated.

b. Inspections. An inspection shall be made on the system by authorized Government and contractor representatives prior to performing acceptance tests on the equipment. The inspection shall be of such character and extent as to disclose any unsatisfactory condition of apparatus or equipment. Where any of the following conditions are observed during inspection or testing of equipment, sufficiently detailed examinations shall be made to disclose the full extent of their existence.

(1) Failure to compare in quantity and code with that specified for the installation.

(2) Apparatus or equipment units damaged or incomplete.

(3) Apparatus or equipment units affected by rust, corrosion, or matted finish.

(4) Other adverse conditions resulting from failure to meet generally accepted standards of good workmanship.

c. Acceptance Tests. 16 weeks prior to cutover the contractor shall provide the contracting officer a system test plan for review and approval which will be used for the final system acceptance testing. The test plan shall consist of a minimum of three parts: functional test(s), load test(s), and performance test(s). Each test shall be conducted in the presence of an authorized representative of the Government and of the contractor. Failure to meet the requirements of any portion of the test plan shall be deemed a failure of the test, which must be rescheduled after appropriate corrections have been made.

(1) Functional Test. The function test shall demonstrate the ability of the system (hardware and software if applicable) equipment components and modules to correctly perform the service functions specified herein. Operational tests shall be performed on all circuits and circuit components to insure that they function properly.

(2) Load Test. The full load test shall demonstrate the ability of the system to perform without degradation under the effective maximum load of traffic. The load test shall not be conducted until after the functional test has been successfully completed.

(3) Performance Test. Within the first 45 days after cutover, the performance test must be satisfactorily completed. The performance test is to determine performance under day-to-day operation during a 30-day period immediately following cutover. The test shall be performed until a consecutive 30-day period has elapsed, during which performance is satisfactory. Final system acceptance will be made immediately following successful completion of the performance test. Failure of the performance test shall be deemed to have occurred when any common system performance requirement, feature, or component does not perform as specified elsewhere in this specification.

2.8 Follow-on Services

a. Maintenance, Service Charges, and Additional System Installations

(1) The contractor shall provide maintenance on the installed system on a preventive (scheduled) and a remedial (routine and emergency call-out) basis. Additional system installation services, as required, for the term of the contract shall also be provided. Costs, if any, associated with these maintenance and installation services shall include all parts and labor and shipping.

(2) If the proposed system utilizes software, the contractor shall install any improved or updated versions issued by the manufacturer, when approved by the Government. Costs to update the software, if any, shall be identified in the proposal.

(3) The contractor shall provide competent, experienced and highly qualified personnel to provide the required maintenance and additional system installation services for the contract period. Proposals shall identify location from which repair personnel will be dispatched and a description of the training and experience of repair personnel.

(4) When a telephone is reported or found to be out of order, it shall be restored to service within 24 working hours after being reported.

(a) The contractor shall make all reasonable efforts to prevent interruptions of service. When interruptions occur, the contractor shall reestablish service with the shortest possible delay.

(b) The contractor shall inform the Government as soon as possible of any occurrence of an unusual nature which may result in prolonged or serious interruption of service.

(5) The contractor shall provide all parts associated with maintenance and additional system installations. Spare parts shall be immediately available either at the location of the telephone switching service facility or the contractor's location. Proposals shall identify locations of spare parts storage or source of supply.

(6) Remedial emergency service calls shall be deemed appropriate when more than 10% of all telephones and/or circuits are involved at any one time. The contractor's personnel shall arrive at the Government installation site within 4 hours on emergency service calls and within 24 working hours on a routine service call. The contractor shall provide emergency service 24 hours per day, seven days a week. The contractor shall specify his guaranteed response time to emergency and routine on-call remedial service calls in his proposal.

(7) The contractor shall be responsible for all contacts and coordination with the telephone company concerning maintenance of trunks, dial-repeating tielines (DRTL's), interconnect arrangement problems, etc., and in ordering new cable facilities for additional off-premise main station lines, trunks, interconnect arrangements, etc. However, the contractor shall not order, install, or place in service any type of equipment where there is an obligation of charges to the Government unless the Government has issued Communications Service Authorization (CSA), form DD 248, for such services.

(8) The Government will submit to the contractor requests for service, such as new main/extension station installations, removals, rearrangements, augmentations to the telephone switching service, facility, etc. The contractor, upon receipt of the original copy (marked "Telco copy") for service shall complete the work required within the (10) working days unless a later date is requested. Service requests for system expansion or upgrade to the telephone switching facility shall be completed within 90 calendar days after receipt of the original copy (Telco copy) of the CSA, or within an earlier time frame which shall be mutually agreed to by the contractor and the Government. The contractor, upon completing the required work, shall notify by telephone the Coast Guard facility Communications Officer, or his designated representative and give the actual date the work was completed along with the service charge(s) applicable to the order, followed by written notice within five (5) working days.

(9) The contractor shall be responsible for the cost of telephone company service visits when a system malfunction is determined to be in the contractor-provided system and not in telephone company provided equipment.

(10) The contractor shall adopt and pursue a maintenance program to include periodic tests, inspections, and preventive maintenance according to the recommended practices furnished by the original equipment manufacturer (OEM) aimed at achieving efficient operation of the system to provide safe and adequate service at all times.

(a) The contractor's proposal shall indicate what type of records the contractor will maintain. Records must include, but not necessarily be limited to: cable and pair assignments, line record cards, tests and inspections, preventive maintenance schedule, equipment failures and feature assignments.

(b) The contractor shall maintain an accurate written record of trouble reports made by the system users. This record shall include appropriate identification of the user by station line affected, the time, date, nature of the trouble report, the action taken to clear trouble or satisfy the trouble complaint, and the date and time of trouble clearance or other dispositions.

(c) The contractor shall preserve and retain all records and reports for the term of the contract and any subsequent contract periods; they shall be made available for inspection and/or analysis to the Government at any time upon request. These records and reports are the property of the U.S. Government and shall be handled in accordance with Coast Guard guidelines, which will be provided upon request.

(11) Maintenance shall include keeping all station equipment, ancillary equipment, and the telephone switching service facility in a good state of repair, consistent with safe and adequate service performance specifications as furnished

by the OEM. Broken, damaged or deteriorated parts shall be repaired or replaced. Adjustable equipment shall be readjusted as necessary when found by preventive routines or fault location tests to be in unsatisfactory operating condition. Electrical faults, such as leakage or poor insulation, noise induction, crosstalk, or poor transmission characteristics, shall be corrected to the extent practical within the design capability of the facility affected.

(12) Whenever the contractor must interrupt service during regular working hours for the purpose of working on the lines, cable, or equipment, the work shall be done at a time which will cause the least inconvenience to the users. Anyone who would be seriously affected by such interruptions shall, so far as possible, be notified in advance.

(13) Whenever contractor, or his representative, observes conditions of facilities or actions of Coast Guard personnel which endangers telephone equipment, switching equipment, the integrity of the system, personnel using the system, or contractor maintenance personnel, he shall notify the communications officer to innitiate corrective action. Written notification is appropriate in severe or repeated occurrances.

b. Traffic and Usage Data. The system shall be equipped to provide traffic data on originating, terminating, and intrasystem usage. Traffic studies shall be conducted for five consecutive normal business days, and at frequencies specified below. Studies will be used to determine adequacy of trunks, access lines, tielines, attendant positions, special features, links, loops and other facilities to maintain the specified grades of service. As a minimum the system shall be capable of providing the following information:

(1) Station Usage Data: (Required semi-annually)

(a) Peg Count (PC) for each station hundreds group. (e.g., NNX-52xx, 200 number group, etc.)

(b) Peg count. All Facilities Busy (AFB), and overflow for each operational access level. (i.e., 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0, usually first digit dialed. This requirement may be altered to accommodate some numbering plans such as split levels 71, 72, 91, 92, etc.)

(c) Station dial tone delays of more than three seconds.

(2) Circuit Traffic Data: (Required quarterly)

(a) Peg count, All Trunks Busy (ATB) and overflow for each circuit group (e.g., access lines, CO trunks, tielines, listed.

(b) Hundred Call Seconds (CCS) carried load for each circuit group. For two-way circuit groups, the CCS shall be identified as TOTAL and INCOMING (ICCS). For directional circuit groups, TOTAL CCS shall be indicated.

(c) Peg Count, ATB, and overflow information shall be correlated with CCS data in traffic study summaries.

(3) Attendant Position Workload: (Required semi-annually)

(a) Average Busy Hour (ABH) answering time per console.

(b) Number and percentage of calls exceeding 20 seconds answer during the busy hour.

(c) ABH peg count and overflow for attendant queue.

(d) Average and maximum number of seconds that a call is in attendant queue.

(4) The contractor shall conduct, maintain records of, and submit reports on completed traffic studies. Raw traffic data, as well as a summary of study results, shall be submitted to the Government within 20 working days after each study has been completed. Traffic summaries shall be extracts of raw data, computed to illustrate Peak Busy Hour (PBH) and Average Busy Hour (ABH) data for each station group, circuit group or attendant operation observed during the study period. The contractor shall not order, install, or place in service any type of equipment based on the results of studies, where there is an obligation of charges to the Government, unless the Government has issued Communications Service Authorization (CSA), DD Form 428, for such service.

2.9 Attendant Console & Features

a. Attendant Console(s). The attendant console(s) shall be provided in accordance with Table 1, and shall meet the requirements as set forth below. Additionally, any attendant console provided shall be supplied with the necessary attendant headsets and accessories. If the system will allow the required functions to be performed from a standard telephone set, a separate attendant console is not necessary to be provided with the system.

(1) Attendant Console

(a) The attendant console shall have the capability to enter Central Office trunk, FTS access line, and FTS tieline calls for talk-off preemption, regardless of whether the call was connected through the attendant console or dialed direct by the station. Any such entry shall be accompanied by a tone burst to alert users that a third party is able to hear the conversation.

(b) Each attendant position shall be equipped with a trunk busy field (may be separate from attendant console or telephone set).

(c) DTMF dialing shall be provided at the attendant console position for extending calls via Central Office trunks, FTS access lines, and FTS tielines. Key pulse dialing shall be available if necessary for any service connected to the system.

(d) The attendant console shall be equipped to provide station users the ability to complete the dialing on other than station-to-station calls after the facility has been selected on attendant-handled outgoing calls (dial-through attendant), such as when attendant allows violation of class of service restrictions.

(e) All features of the attendant console positions, to include all lamps and control equipment, shall be battery powered to insure continuous operation in the event of a commercial power failure. This includes any special recording equipment.

(f) Attendant console positions in multiple shall have identical capability and have full access to all trunks and stations.

(g) Each attendant console shall be equipped with incoming call identification lamps for discrete trunk identification for each trunk group serving the system which has access to the consoles.

(h) Attendant consoles shall be equipped to receive incoming calls from Central Office trunks, FTS, access lines, and other trunk groups that may be associated with the proposed system and extend such calls as necessary to the designated destination.

(i) The console shall be equipped to allow the attendant to establish conference calls (see sect. 2.10.c).

(j) Call-splitting capability must be provided which will permit the attendant to exclude either the outside or inside party when trunk calls are handled by the attendant.

(k) Each position shall be designed so that the attendant will have the option to extend an operator-assisted call by fixed-loop or blocked release (retains control of call until completed) or release loop (release from call once established) for each trunk group serving the telephone switching system.

(l) Each position shall be designed to provide answer and disconnect supervision on all calls extended by the console attendant on a fixed-loop or blocked release basis.

(m) Each console shall have the capability of being placed in-service or taken out-of-service without affecting other consoles or system operations.

(n) Consoles shall be provided with a lamp test to verify that all lamps are serviceable.

b. Attendant Station Selection. Attendant station selection shall be provided, and shall be designed to permit, the attendant to complete all attendant-assisted calls to station numbers within the proposed telephone system as may be requested by the calling party using DTMF dialing.

c. Conference. The telephone system shall provide for, and be designed to permit, the console attendant to establish a minimum of one five-party conference call consisting of trunks and/or stations in any combination.

d. Access to Attendant (0 level). Access to the Attendant (0 level) shall be provided by dialing 0 and be designed for station access to the attendant console for assistance. Incoming calls to the attendant shall be extendable by the attendant to any circuit or station connected to the telephone system.

e. Executive Right-of-Way (Attendant Only)(Line Verification). Attendant-only executive right-of-way or equivalent shall be provided and be designed to provide the switchboard/console attendant the ability to verify the conditions of station lines and circuit groups, and to override a conversation in progress. The executive right-of-way shall be equipped with an identifiable tone to both parties when the attendant overrides a conversation on a busy line or trunk.

f. Attendant Camp-on. A service feature permitting the attendant to hold an incoming call until the called party is free. A tone is heard by the busy party which alerts him/her that a call is waiting. When the called party hangs up on the original call, the phone will ring and will automatically be connected to the call that had been waiting.

2.10 Interface with existing Government owned Systems. The system must be capable of interface with the following systems without use of interconnect arrangements (sect. 2.5.e.). With the exception of Public Address systems (e. below), system must allow these systems use of all user features available to on-premise station users.

a. _____; Northern Telecon Pulse 120 (SG1A) Electronic Private Automatic Branch Exchange (EPABX), connected by leased dial repeating tie lines (___).

b. CGC _____: (Docked to Pier ___) Northern Telecon 12A Key System, with station line. Connection is by amphenol plug. Coast Guard responsible for main-

tenance from shore side of plug to ship and all equipment installed on ship.

c. (etc.)

d. Public Address Systems:

(1) _____:

(2) (etc.)

e. Station _____: Northern Telecom 1A2 Key System, with ___ station lines.

2.11 Installation and Cutover

a. In his proposal, offeror shall fully describe the proposed method of ensuring minimum outage during installation and cutover, including cable (inside and outside plant), station equipment, and switching system logistics. Offeror shall also describe the proposed method of ensuring no outage to critical locations. Locations that cannot accept any outage are:

(1) _____
_____

(2) _____

b. Offerer shall state method, and cost if applicable, for providing intercept of critical telephone numbers that will change upon cutover. Intercept must refer caller to the new number. Central office intercept with no charge to caller is preferred, but not required. Any cost cited will be included in total system price. Critical numbers are:

(1)

(2)

(3)

c. Within 30 days of award, the contractor shall prepare and submit to the Coast Guard for review and approval a system implementation schedule to include a milestone plan to show the orderly progression of events leading to the timely completion and cutover of the system to service i.e., equipment delivery, installation schedule, cutover plan, training plan, delivery

of test plan, delivery of system drawings, delivery of test cutover plans, and system acceptance. The implementation plan shall be designed to show the cutover date for the system, as agreed to by the Coast Guard, the contractor and the local telephone company.

d. The contractor shall perform the necessary detailed engineering, installation, and cutover for the total system including, but not limited to, switching equipment, on-premise and off-premise station equipment, trunk circuits, power systems, cable terminals, and house cable. All elements of the system installation shall conform to local building and electrical codes.

e. The contractor shall provide and implement a comprehensive test plan and cutover plan. Interruption to any existing telephone service during the installation of the system will be minimized. Cutover dates shall be coordinated with the local telephone company and the Coast Guard. The test and cutover plans shall be submitted to the Coast Guard for approval no less than 16 weeks prior to cutover.

f. Prior to acceptance testing the contractor shall certify to the Government that all system hardware and features provided in the system have been thoroughly tested to ensure that no mechanical or electrical problems exist, and that all system features are functional.

g. To the extent possible, the system shall be assembled and wired at the factory or contractors facility (except for interbay connections and connections to the distribution frame.) The system shall be tested and adjusted to maximum extend possible before shipment.

h. Upon completion of the system's installation and prior to acceptance by the Government, all equipment shall be thoroughly cleaned and made free from extraneous bits of solder, wire, etc., by the contractor. Debris resulting from the installation shall be removed from all areas and be disposed of by the contractor.

3.0 OPTIONAL SERVICE OFFERINGS

This section is not completed. Suggestions for inclusion are (any of which you may want to include as required features):

a. Additions to user features, such as executive override, camp-on, queing for outgoing trunks with call-back, etc.

b. Remote diagnostic testing on contractor's premises.

c. Dual processors.

d. Various systems to provide management reports of system usage, tailored billing, etc. (Such as AMA, ANI, AIOD, etc.).

e. Digital switch.

4.0 GLOSSARY OF TERMS

4.1 Technical

Access Line (FTS): A telephone trunk line connected to a Federal Telecommunications System switch to either establish or receive calls to or from a particular FTS user.

Add on: A service feature available in some switching systems that by depressing the telephone switchhook holds an existing call and provides a second dial tone and the capability to call a third person. After calling the third person (on the system), depressing the switchhook again established a three-way conference.

Alarm: Device such as a bell, lamp, horn, gong, or buzzer, or a combination of these elements, arranged to call attention to some unusual condition.

All facilities Busy (AFB): A condition where all equipment, links, paths, etc., internal to the system are occupied. Attempts to access these facilities furing an AFB condition will result in overflow and the return of busy tone (120 IPM).

All Trunks Busy (ATB): A condition where all circuits in a circuit group are occupied. Attempts to access circuit groups during an ATB condition will result in overflow and the return of busy tone (120 IPM).

Attendant's Cabinet/Console: A cordless switchboard position used by an attendant to answer and extend telephone calls in association with an attended telephone switching system.

Attendant Camp On: A service feature permitting the attendant to hold an incoming call until the called party is free. A tone is heard by the busy party which alters him/her that a call is waiting. When the called party hangs up on the original call, the phone will ring and will automatically be connected to the call that had been waiting.

Attendant Conference: A conference arrangement which permits the attendant to arrange to have multiple telephones or trunks on a single connection.

Audible Ringback Signal: An audible signal connected to the calling line to indicate that the called number is being rung.

Automatic Telephone Switching System: A telephone system in which communications between subscribers is effected without the aid of an operator, by means of switches set in operation by the originating subscriber's equipment.

Automatic Message Accounting (AMA): An arrangement of apparatus belonging to the common carriers for recording and processing on continuous tapes the data required for computing telephone charges on completed toll calls and for providing a percentage sample on completed FTS calls. See Identified Outward Dial.

Automatic Number Identification (ANI): A service or equipment that automatically records the calling number on a completed toll call or FTS call. This is normally part of AMA and is offered by certain local telephone companies with customer provided telephone systems. See Identified Outward Dial.

Busy Hour: The peak 60-minutes during a business day when the largest volume of communications traffic is handled.

Cable: An assembly of one or more wire conductors, usually within an enveloping protective sheath.

Cable Terminal: A structure adapted to be associated with a cable by means of which electric connections is made available for any predetermined group of cable condustors in such a manner as to permit their individual selection and extension by conductors outside of the cable.

Call Forwarding: A service feature available in some switching systems where calls can be arranged to be re-routed automatically from one station number to another or to the attendant. This service feature is manually activated by the station user.

Call Forwarding - Busy Line: When both the called number and alternate numbers are busy, the incoming call will automatically be routed to the attendant.

Call Forwarding - Don't Answer: Following a pre-determined number of rings, incoming calls will automatically route to the attendant.

Call Hold: An existing call can be held while placing a second call and then return to the original call.

Call Transfer: Station user can transfer a call to another station without the aid of the attendant.

Call Transfer Attendant: The attendant can transfer existing calls from one station to another after being signalled by a station user.

Camp On: A method of automatically holding an incoming call for a line that is in use, and of signaling when the line is free. A momentary signal is normally passed to the busy called station to indicate that there is a camp-on call waiting.

Card Dialer: Automatic dialer combined with a regular telephone. Phone numbers coded on a card are inserted in the card dialer for fast dialing.

Central Office: A telephone switching system(s) owned by the common carriers.

Channel: A path for electrical transmission between two or more points. Also called a circuit, facility, line, link, or path.

Circuit: (1) Electronic path between two or more points-channel; (2) Number of conductors connected together for the purpose of carrying an electrical current; (3) Connected assemblage of electrical components such as resistance, capacitors, inductors, and relays having desired electrical characteristics.

Class of Service: Definition of allowable calling pattern. A users line is restricted from calling on facilities not within its class of service designation.

CCSA: Common Control Switching Arrangements: designed for customers having extensive private line communications requirements such as the FTS.

Common Equipment: Equipment that is used in a telephone that is common to the total switching system.

Communications Common Carrier: A company which provides communications services or classes or communications services to the public and whose charges and services are subject utility regulation.

Cross Talk: Voice Communications in one circuit being overhead in another circuit.

Customer-Provided Equipment: Term applied to equipment owned by the customer or leased from vendors other than the common carrier.

Dial: A type of calling device which, when would up and released, generates pulses required for establishing connection in a telephone system.

Dial Dictation Access: A service feature available with some switching systems which permit dialing a special number of access centralized dictation equipment.

Dial Switching System/Equipment: An automatic telephone system whereby one user can establish, through electromechanical or electronic equipment, a connection to another telephone user without the assistance of the attendant.

Dial Telephone System: A telephone system in which telephone connections between customers are ordinarily established by electronic and mechanical apparatus, controlled by manipulations of dials by the calling party.

Dial Through Attendant: A feature which allows a station user to complete the dialing on an attendant-handled outgoing call after the attendant selects the facility.

Digit: One of the symbols 0, 1 to 9. Also used in telephone to describe the impulse sequence produced by the telephone dial.

Direct Distance Dialing (DDD): A telephone service which enables a user to dial directly telephones outside th user's local area without the aid of an operator.

Direct Inward Dialing (DID): Incoming calls are directed to the intended recipient without attendant action. To accomplish this, the incoming trunks (central office or FTS) must carry some address digits (telephone number of station called).

Direct In-Dial/Out-Dial (DIOD): Combination of features of DID and DOD.

Direct Outward Dialing (DOD): All outgoing calls can be placed directly by dialing an initial digit (access digit) and then the desired number without the aid of an attendant.

Dual Tone Multi-Frequency (DTMF): Better known as "touch tone", a registered trademark of the Bell System. DTMF is fully described in industry literature and EIA Standard RS-464.

Electronic Key Telephone: An instrument that uses advanced electronic features to evaluate key telephone with an installation similar to a single line instrument, such as a single or double pair station line.

Electronic Switching System (ESS): A communications switching system which uses solid state devices and other computer-type equipment and principles.

Entrance Facility: The facility between the customer's premises and the telephone central office or the customer-provided equipment.

Extension Station: Additional telephone station associated with a main station and having the same telephone number as the main station.

Federal Telecommunications System (FTS): Government communications system administered by GSA covering 50 states including Puerto Rico and the Virgin Islands, providing services for voice, teletypewriter, facsimile, and data transmission.

Fixed Loop: A feature available with some attendant positions that permit the attendant on an attendant assisted call to retain connection through the attendant positions for the duration of the call. The attendant will normally receive a disconnect signal when the call has been terminated.

Foreign Exchange Line (FX): A service which connects a customer's telephone equipment to a remote telephone central office.

Grade of Service: Represents that grade of service which must be available to users of a telephone system. For example, a grade of service of P.01 means no more than one lost call in 100 attempts during the system busy hour.

Holding Time: The length of time a communications channel or facility is in use for each transmission. Includes both message time and operating time.

House Cable: Telephone cable within a building for the purpose of providing communication and signal paths between station equipment and between station equipment and a Dial Switching System.

Identified Outward Dial (I.O.D.): A service offered by some telephone companies to automatically identify and prepare a statement of charges on an individual number basis for completed toll calls and multi-message unit calls. Charges are normally identified with the telephone number from where the call was placed. This service is associated with ANI and AMA.

Incoming Trunk: A trunk incoming from a telephone central office.

Intercept Service: Service provided to subscribers whereby calls to disconnected numbers or unassigned station numbers are routed to an intercept operator or mechanical recorder for information.

Interconnect Arrangement: A protective device located between customer-owned communication equipment and that of the tariffed telephone company.

Interconnections: Generally refers to the interconnection of a privately-owned telephone system to that of a common carrier.

Interface: A shared boundary; for example, the boundary between two subsystems or two devices.

Intermediate Distributing Frame (IDF): A distributing frame, the primary purpose of which is to cross-connect the various equipments and lines in a telephone system to each other.

Installation Charge: Nonrecurring charge which applies to certain items of installed equipment, and which covers all or part of the cost of installation of the telephone system including the installation and moves of telephones.

Key Set: Another name for multi-line telephones, wherein the buttons (keys) are used for intercom, holding, signaling, and/or pick-up of additional telephone lines.

Lamp-idle Trunk: Signal lamp associated with an outgoing trunk to indicate whether the trunk is busy.

Line Circuit: Relay equipment associated with each subscriber line connected to a telephone switching system.

Line Lamp: Switchboard lamp for indicating an incoming line signal.

Line Verification: A service feature which permits the attendant to verify the busy or idle state of station lines and to break in on the conversation. When the attendant is connected to a busy line, tones are applied periodically to the line to alert the calling and called parties of the presence of the attendant.

Loop: A communications channel between the telephone switching system and the user telephone.

Main Distributing Frame: A distributing frame, on one part of which terminate the permanent outside lines entering the telephone switching system and on another part which terminate the telephone switching equipment. It usually carries the protective devices and functions as a test point between the inside equipment and the outside lines.

Main Station: A telephone station with a distinct call number designation directly connected to the telephone switching system.

Maintenance: (1) Action taken to retain equipment in a serviceable condition or to restore it to servicability. It includes inspection, testing, servicing, classification as to the serviceability, repairs, rebuilding, and reclamation; (2) routine recurring work required to keep equipment or a facility in such condition that it may be continuously utilized, at its original or designed capacity and efficiency, for its intended purpose; (3) responding to service orders for the installation and moves of additional or existing subscriber station equipments.

Maintenance Preventives: Care and service by personnel for the purpose of maintaining equipment and facilities in a satisfactory operating condition by providing for systematic inspection, detection, and correction of

incipient features before they occur or before they develop into major defects.

Mileage: Distance from the telephone switching system to a subscriber located some distance away or the distance to a telephone company central office or common carrier switching plan.

Network-System: (1) Interconnection of specific organizations or geographical locations by communications means for functional purposes. (2) Circuits and switching devices which are connected together according to limitations of a general switching plan.

Night Service: After hour calls directed to the attendant will be automatically routed to predetermined station numbers.

NIOD: Network In-Out Dialing without the aid of the attendant.

Off-Premise Stations: Stations located outside the building housing the Dial Switching System or a distance from the customer/primary location.

On-Premise Stations: Stations located within the building housing the Dial Switching System or at the customer/primary location.

One-Way Trunk: A trunk between the telephone switching system and the common carrier's system(s) used for calls that originate at one of these offices, but not for calls that originate at the other. At the originating end, the one-way trunk is known as an outgoing trunk; at the other end, it is known as an incoming trunk.

Operator-Attendant: A person whose duties include operating a switchboard.

Overflow: Generally, the generation of volume of traffic beyond the capacity of a telephone system, trunk circuit group, or other circuit groups within the telephone switching system.

Reorder Tone (120 IPM): A tone received by the calling station when switching paths, trunks, or other communication equipment (except station numbers) are unavailable for use during a call attempt.

Release Loop: Feature available with some attendant positions that permit the attendant on attendant assisted calls to release the attendant position from a connection when the called station answers. Normally used for incoming listed number and transfer call request.

Restricted Service: Selected stations within the telephone system can be denied the ability to place outside calls and calls to the attendant.

Rotary Dial Telephone: A telephone that sends dial pulses to the telephone switching equipment to establish a communications path.

Sampling: A technique of system analysis whereby traffic usage is estimated based on a representative sample.

Sequence Hunting: See Station Hunting.

Station Equipment: One of the input or output points on the Switching System, such as the telephone set and all associated key telephone equipment located at the site.

Station Hunting: Incoming calls to a busy station will automatically be routed to a predetermined alternate station.

Station-to-Station Calling: Calls are placed from station-to-station without the aid of the attendant by dialing two ore more digits.

Subscriber: Person or organization which telephone service is extended.

Subscriber's Equipment: That portion of a system installed at the location of the subscriber.

Subscriber Line: A telephone line between the telephone switching equipment and a subscriber telephone station.

Supervision: Telephone practice, the process of watching over the condition of a connection at a switchboard in order to determine when a transmission is complete so the connection can be broken.

Switchboard: See Attendant Cabinet/Console.

Switched Message Network: A network of telephone lines and switching equipment normally used for local and intercity telephone and data communications.

Switching Center: A location where an incominb call/ message is automatically or manually directed to one or more outgoing circuits.

System: A collection of operations/procedures/equip-ments united to accomplish a specific objective. A telephone system as a minimum consist of the basic switching equipment, user telephone instruments, miscellaneous station equipment, trunks, tielines, and interconnecting loops.

Tandem Telephone Switching System: A telephone switching system primarily used as a switching point for traffic between two other telephone systems.

Tariff: A schedule published by a communications common carrier and filed with a public service commission describing the services provided by the carrier, the rates therefore, and the conditions under which they are offered.

Terminal: An input/output device designed to receive and/or send source data in an environment associated with the job to be performed and capable of transmitting entries to the obtaining output from the system of which it is a part.

Test and Maintenance Facility: A facility equipped with testing apparatus so arranged that connections can be made from it to telephone lines, trunks, tielines, and the telephone system for testing purposes.

Test Set - Portable: A non-fixed item of communications-electronic equipment which is used to locate faults and troubles in circuits and equipment.

Tieline: A private line communication channel of the type provided by communications common carriers for linking two or more points or switching systems together.

Toll Diversion: All or selected station numbers within the telephone system can be denied the ability to place certain toll calls. The diverted calls may either be routed to an attendant or connected to a special tone.

Tone Dialing: A service that permits push-button dialing rather than rotary dial. See DTMF.

Traffic: The total information flow of a communications system.

Trunk: Circuit directly connecting two distant telephone switching.

Trunk Answer From Any Station (TAS): A feature to allow incoming calls to be answered when the attendant position is unattended from any station by dialing two or more digits. The calls may then be transferred to any other station on the system when necessary.

Trunk Group: All of the trunks of a given type or characteristic that extends between two switching points.

Trunk/Tieline Verification: A service which permits the attendant to verify the busy or idle conditions of one member of a trunk group serving the telephone system. The attendant may also preempt the trunk member for any important call.

Universal Night Answer: Application of Trunk Answer from any station (TAS).

Wide Area Telecommunications Service (WATS): A service provided by a telephone company which permits a customer by use of an access line to make calls to or receive calls from telephones from a specific area on a dial basis for a flat monthly charge.

ATTACHMENT 1

SUBSCRIBER IDENTIFICATION AND LOCATION

Agency and Location	Present Service	
	Main Stations	Extension Stations

TABLE 1
ESTIMATED FACILITIES REQUIREMENTS

Facilities	Initially Equipped	Assigned at Cutover	Estimated Facilities Assigned at the Beginning of the Period-in "Month": (All columns to be filled by Government)							
			"0"	"12"	"24"	"36"	"48"	"60"	"72"	"84"	"90"
Main Station Lines											
Extension Station Lines											
Station to Trunk Tielines											
Central Office Trunks:											
Manual In, Dial Out											
1-way outgoing (DOD) (arranged for FTS tieline access only and provided with toll restriction)											
2-way incoming to attendant, outgoing from attendant and dial "9" access from stations											
Direst In-Dial											
1-way incoming (DID)											
2-way incoming and outgoing (DIOD)											

Facilities	Initially Equipped	Assigned at Cutover	Estimated Facilities Assigned at the Beginning of the Period-In "Month": (All columns to be filled by Government)
			"0" "12" "24" "36" "48" "60" "72" "84" "96"
FTS Access Lines	_____	_____	
Dial Repeating Tielines Two-way			
NIOD	_____	_____	
Manual In, Dial	_____	_____	
Foreign Exchange	_____	_____	
WATS	_____	_____	
Instruments:			
Single line	_____	_____	
6 Button	_____	_____	
Speakerphones:			
Single line	_____	_____	
6 Button	_____	_____	
10 Button	_____	_____	
20 Button	_____	_____	
List ALL types required and anticipated			

THE SYSTEM SHALL BE CAPABLE OF PROVIDING FOR POSSIBLE FUTURE EXPANSION TO _____ LINES AND _____ TRUNKS.

NOTE: The system shall be capable of providing requirements stated in the "Initially Equipped" column by the simple addition of plug-in equipment. Equipment to provide hat which is required in the "Assigned at Cutover" column must be installed initially and included in the proposed system pricing schedules. Evaluation of offers will be based on "Assigned at Cutover" prices and prices for expansion to meet the 10 year requirement.

TABLE 2

TRAFFIC DATA

Busy-hour Traffic per Main Station	CCS/MS*
Originating Traffic	CCS/MS
a. Intrasystem	CCS/MS
b. FTS-Outgoing (DOD from stations)	CCS/MS
c. Central Office-Digit Nine Access	CCS/MS
d. Operator-Digit "0" Access	CCS/MS
e. Tie line (etc. - list)	CCS/MS
Terminating Traffic	CCS/MS
a. Intrasystem	CCS/MS
b. Central Office - DID to Station	CCS/MS
c. FTS - DID to Station	CCS/MS
d. Tie Line (etc - list)	

*Hundred Call Seconds per Main Station

NOTE: Traffic data revision is based on a detailed traffic study conducted on _____.

TABLE 3

CLASS OF SERVICE FOR OUTGOING TRUNK GROUP ACCESS*

Trunk Groups	Attendant	Station Class of Service 1	2	3	4
Station-to-Trunk					
Tieline	X				
Central Office Trunks					
No Toll Restriction	X				
Toll Restriction	X				
DIOD	X				
DOD	X				
FTS:					
NOD Trunks	X				
NIOD	X				
NOD Tielines	X				
NIOD Tielines	X				
Foreign Exchange	X				
WATS	X				

* X indicates access allowed.

4.2 CONTRACTUAL

Contract Life: Period starting with date of award until the expiration date of the contract. The maximum contract life period, including exercise of any options to extend the term of the contract, is ten (10) years, one hundred and twenty (120) months.

Equipment Life: Period of item for which the equipment will continue to function properly, given reasonable care and maintenance.

Evaluated System's Life: Period of time used in the Government's economic evaluation to determine what it will cost to satisfy the Government's requirement.

Installation Lead Time: Period of time between the date of award and cutover.

System's Life: Period of time consisting of Contract Life, less the Installation Lead Time.

Term of Contract: Same as Contract Life.

IX. BIBLIOGRAPHY. The following documents should be available to all personnel involved in procuring telecommunications services or support. Specific references will be indicated in the discussions in following sections; these should be consulted if the situation indicates.

1. Office of Management and Budget (OMB) Circular A-76 (revised 29 March 1979), with Cost Analysis Handbook.
2. Office of Telecommunications Policy (OTP) Circular No. 13. (Now effective under the authority of OMB in accordance with OMB Bulletin No. 78-15 dated 30 June 1978).
3. General Services Administration (GSA) Federal Property Management Regulation (FPMR) 101.37.

4. GSA Temporary Regulation 51 dated 3 July 1979.
5. COMDTINST M2000.3 Coast Guard Telecommunications Manual.
6. COMDTNOTE 4200 of 28 Jan 1980.
7. COMDTINST M16010.1 Coast Guard Planning and Programming Manual.
8. CG-255 Manual of Budgetary Administration.
9. CG-264 Comptroller Manual.
10. CG-407 Manual of Contracting Procedures.
11. EIA Standard RS-464, "Private Branch Exchange (PBX) Switching Equipment for voice band applications", Published by the Electronic Industries Association.
12. Government Contracts Reports (Published by the Commerce Clearing House. There are reports of Comptroller General rulings on contract disputes).

APPENDIX D

MAJOR INVENTIONS AND DEVELOPMENTS WHICH, IN COMBINATION, HAVE THE POTENTIAL OF CHANGING THE FABRIC OF SOCIETY

The communication satellite. Satellite have provided telephone and television links to the underdeveloped world. The satellite antennae in some underdeveloped countries stand next to fields proloughed by oxen. Now satellites have the potential of revolutionizing corporate communications both nationally and internationally.

Low-cost satellite earth stations. Planar microwave circuits make it possible to mass-produce satellite receiving equipment at very low cost. Satellite receivers cheap enough for home purchase have been used in Canada, Japan, and India.

Demand-assigned multiple-access equipment. Satellite or high-capacity channels can be shared by multiple geographically dispersed users in a highly flexible manner, portions of channel capacity being allocated to users according to their instantaneous needs.

The helical waveguide. A pipe, now operating, that can carry 250,000 or more simultaneous telephone calls or equivalent information, in digital form, over long distances.

The laser. This means of transmission has the theoretical potential of carrying many millions of simultaneous telephone calls or their equivalent. It is being used with optical fibers to carry several thousand.

Optical fibers. A thin flexible fiber made of extremely pure glass which can carry a thousand times as much information as a copper wire pair. Optical communication fibers are now on the market; some are in use carrying public telephone calls. Many thousands of such fibers can be packed into one flexible cable.

Large-scale integration (LSI). A form of ultraminiaturized computer circuitry that probably marks the beginning of mass procuction of computerlike logic circuitry. It offers the potential of extremely reliable, extremely small, and, in some of its forms, extremely fast logic circuitry and memory. If large-enough quantities can be built, this circuitry can become very low in cost.

On-line real-time computers. Computers capable of responding to many distant terminals on telecommunication lines at a speed geared to human thinking. They have the potential of bringing the power and information of innumerable computers into every office and eventually every home.

Microcomputers. Mass-producible miniature computers of low cost.

Video telephones. Telephones with which subscribers see as well as hear each other or can see still images.

Large TV screens. TV screens that can occupy a wall if necessary.

Cable TV. A cable into homes with a potential signal-carrying capacity more than one thousand times that of the telephone cable. It can be used for signals other than television.

Voice answerback. Computers can now assemble human-voice words and speak them over the telephone. Voice answerback and the pushbutton telephone set, makes every such telephone a potential computer terminal.

Millimeter-wave radio. Radio at frequencies in the band above the microwave band can relay a quantity of information greater than all the other radio bands combined. Chains of closely spaced antennas will distribute these millimeter-wave signals.

Cellular mobile radio. A system organization that will permit many radio telephones or other mobile radio devices in a city.

Packet radio. Radio systems for computer terminals that will make pocket terminals, or other small mobile terminals practicable.

Data broadcasting. Information can be broadcast in digital form at VHF or UHF frequencies for reception on home TV sets, special terminals, or portable devices.

Pulse code modulation. All signals, including telephone, Picturephone, music, facsimile, and television, can be converted into digital bit streams and transmitted, along with computer data, over the same digital links. Major advantages accrue from this.

Codecs. Circuits which convert signals such as speech, music and television into a bit stream, and convert such bit streams back into the original signal. Codecs will become increasingly inexpensive and efficient.

Computerized switching. Computerized telephone exchanges are coming into operation offering many new services, and computerlike logic can be employed for switching and "concentrating" all types of signals.

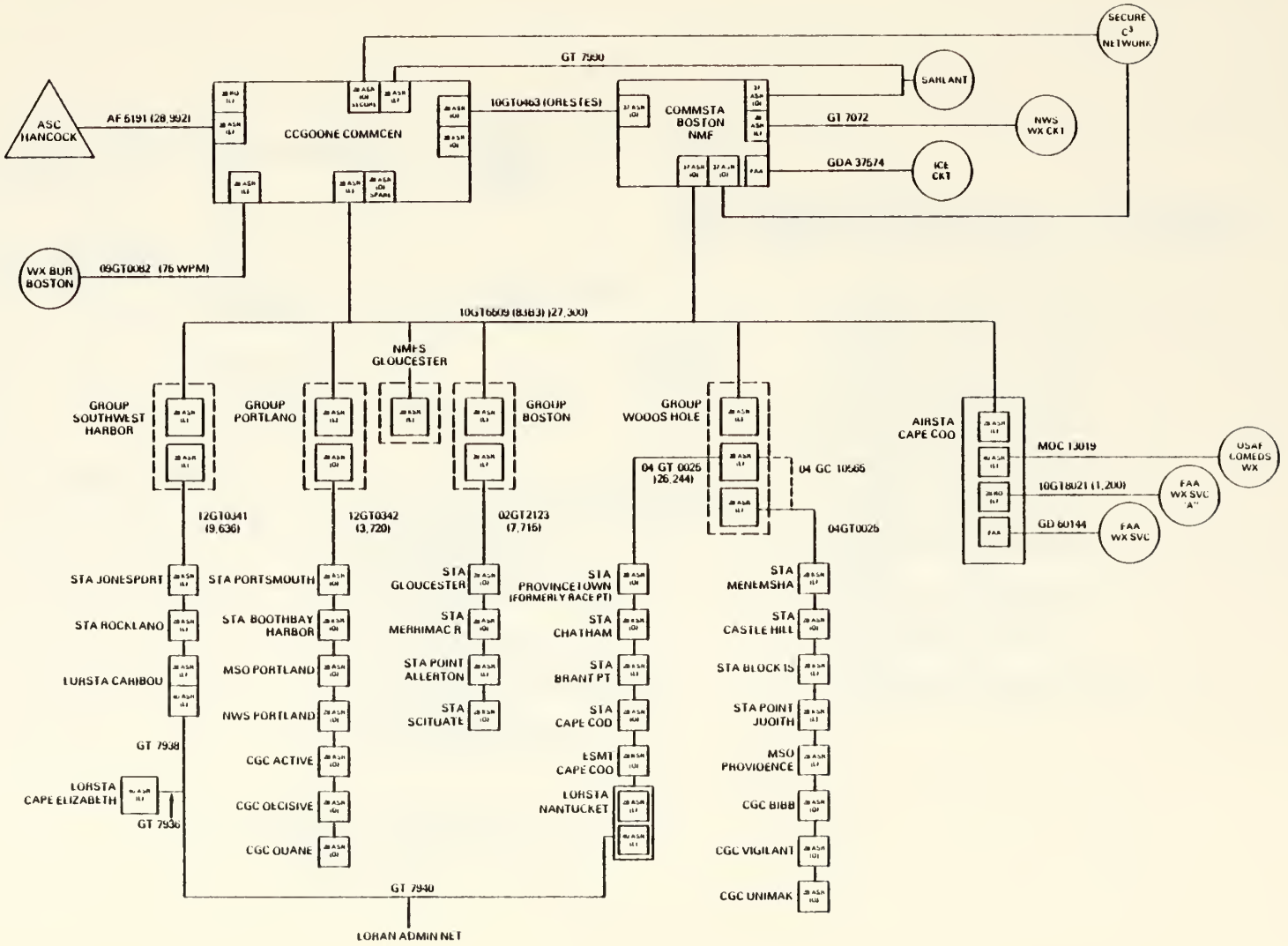
Data banks. Electronic storage for huge quantites of information that can be manipulated and indexed by computers and that can be accessed in a fraction of a second.

Packet switching networks. One way of building generalized switched data networks interconnecting computers and terminals. A widely accepted standard CCITT x .25 exists so that packet switching networks of different countries will be interconnectable.

Electronic switching system (ESS). A Bell System term for computerized telephone exchange. ESS 1 is a central office. ESS 101 gives private branch exchange (PBX) switching control from a central office.

APPENDIX E

COAST GUARD LEASED LINE CIRCUITRY FOR RECORD TRAFFIC TELECOMMUNICATIONS, SCHEMATIC REPRESENTATION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GDA 37674
ICE CKT
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GROUP SOUTHWEST HARBOR
GROUP PORTLAND
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MSO PORTLAND
NWS PORTLAND
CGC ACTIVE
CGC DECISIVE
CGC DUANE
STA GLOUCESTER
STA MERRIMAC R
STA POINT ALLERTON
STA SCITUATE
STA PROVINCETOWN (FORMERLY RACE PT)
STA CHATHAM
STA BRANT PT
STA CAPE COD
ESMT CAPE COD
LORSTA NANTUCKET
STA MENEMSHA
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MSO PROVIDENCE
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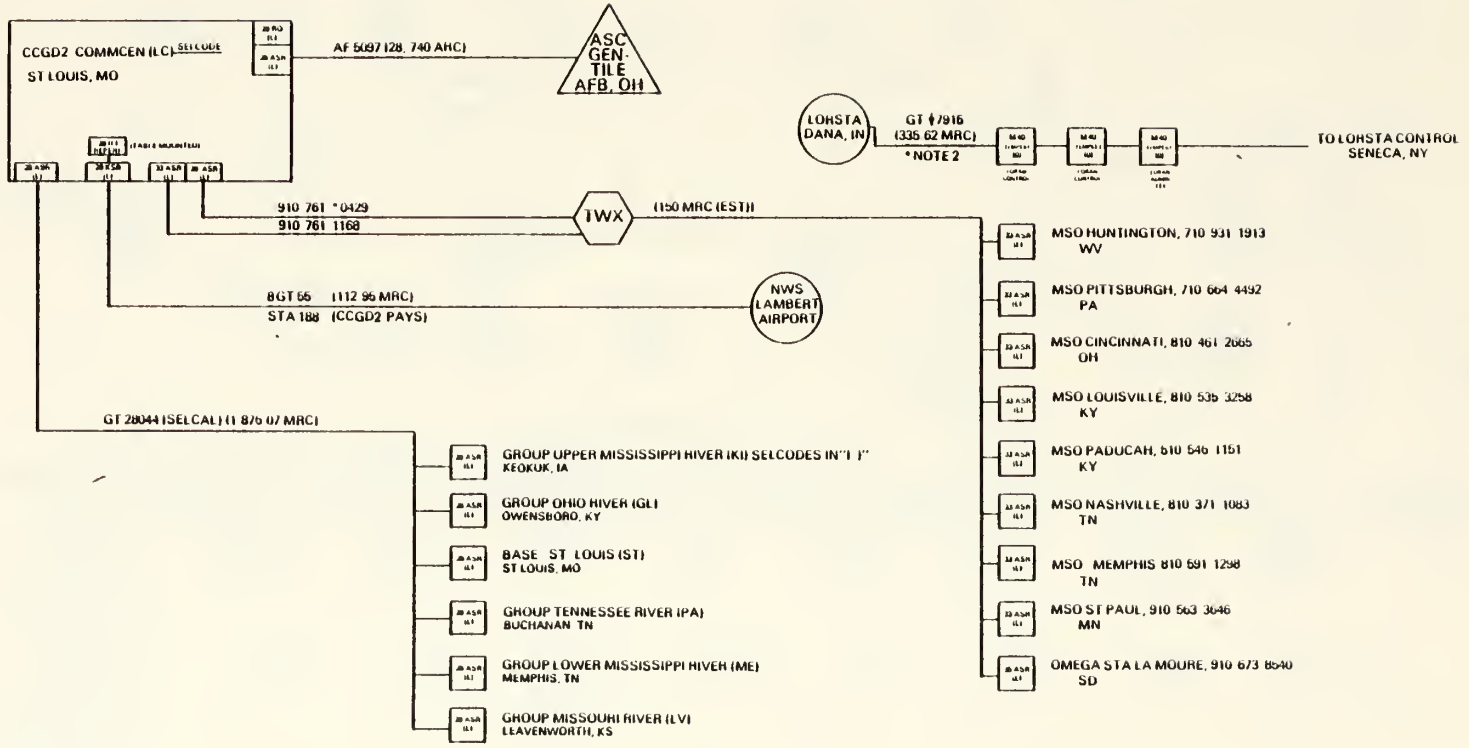
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LORSTA DANA, IN
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*NOTE 2
TO LORSTA CONTROL SENECA, NY
910 761 *0429
910 761 1168
TWX
(150 MRC (EST))
8GT 55 (112 96 MRC)
STA 188 (CCGD2 PAYS)
NWS LAMBERT AIRPORT
MSO HUNTINGTON, 710 931 1913 WV
MSO PITTSBURGH, 710 664 4492 PA
MSO CINCINNATI, 810 461 2665 OH
MSO LOUISVILLE, 810 535 3258 KY
MSO PADUCAH, 810 546 1151 KY
MSO NASHVILLE, 810 371 1083 TN
MSO MEMPHIS 810 691 1298 TN
MSO ST PAUL, 910 563 3646 MN
OMEGA STA LA MOURE, 910 673 8640 SD
GT 28044 (SELCAL) (1 876 07 MRC)
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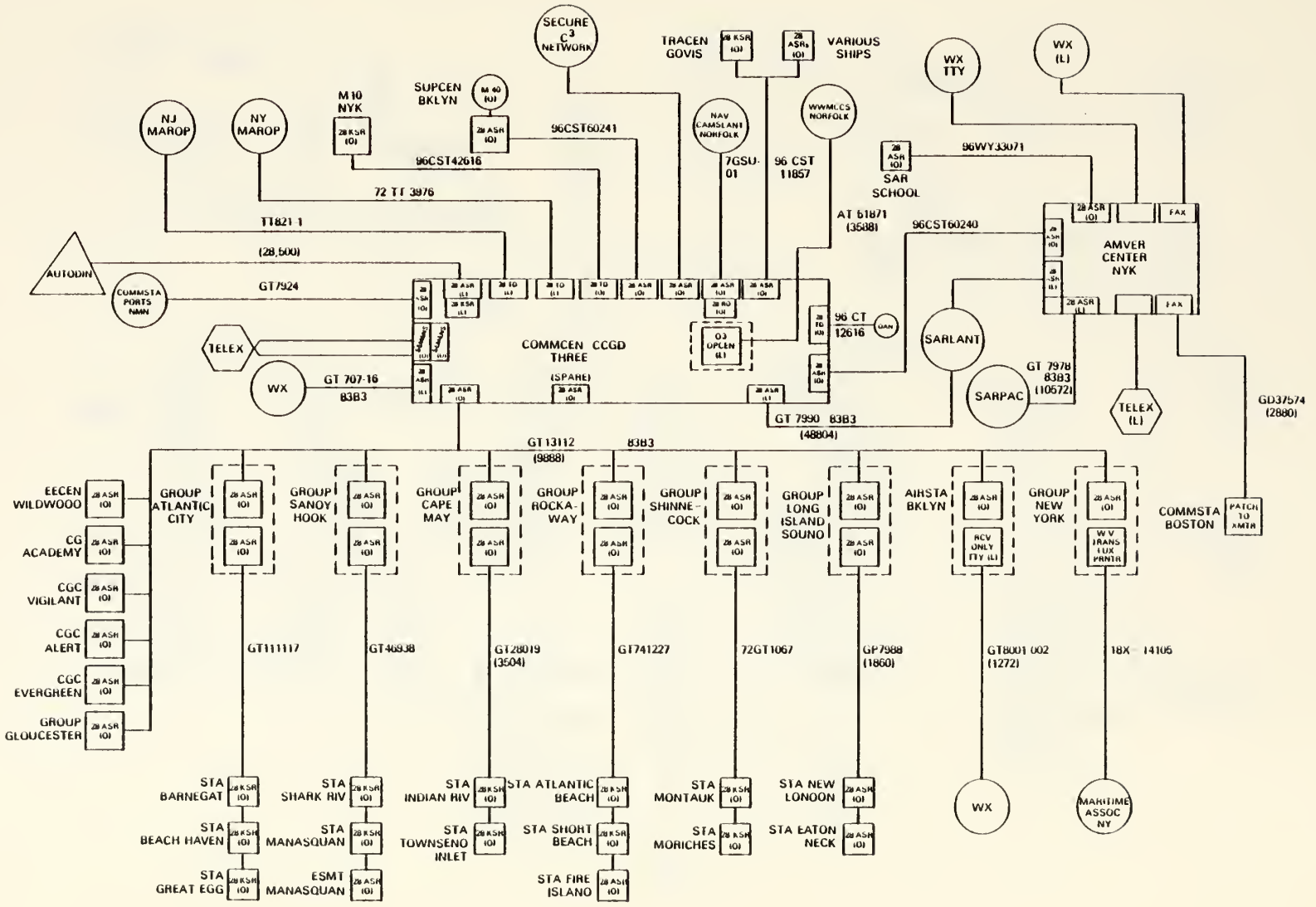
KEOKUK, IA
GROUP OHIO RIVER (GL)
OWENSBORO, KY
BASE ST LOUIS (ST)
ST LOUIS, MO
GROUP TENNESSEE RIVER (PA)
BUCHANAN TN
GROUP LOWER MISSISSIPPI RIVER (ME)
MEMPHIS, TN
GROUP MISSOURI RIVER (LV)
LEAVENWORTH, KS

NOTES. (1) ALL TERMINAL EQUIP IS UNDER LEASE

(2) 3 EACH MODEL 40/TEMPEST TTYs ARE CG OWNED AT LORSTA DANA, IN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GROUP LONG ISLAND SOUND
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GROUP NEW YORK
COMMSTA BOSTON
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STA INDIAN RIV
STA TOWNSEND INLET
STA ATLANTIC BEACH
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WX
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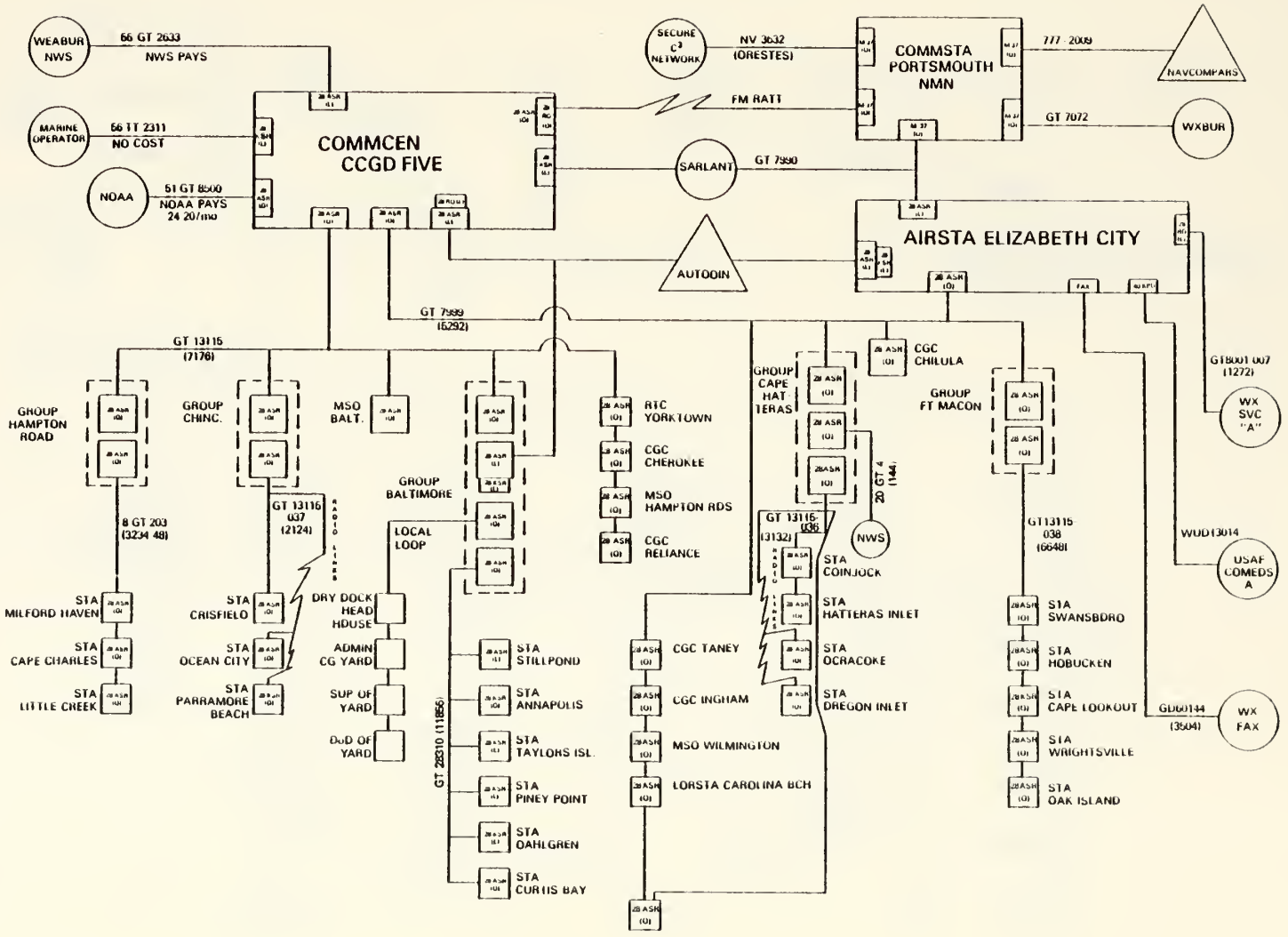
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NOAA
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NOAA PAYS
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COMMCEN CCGD FIVE
SECURE C³ NETWORK
NV 3632
(ORESTES)
COMMSTA PORTSMOUTH NMN
777-2009
NAVCOMPARS
FM RATT
GT 7072
WXBUR
SARLANT
GT 7990
AUTODIN
AIRSTA ELIZABETH CITY
GT 7989
(5292)
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GROUP HAMPTON ROAD
GROUP CHINC.
MSO BALT.
GROUP BALTIMORE
RTC YORKTOWN
CGC CHEROKEE
MSO HAMPTON RDS
CGC RELIANCE
GROUP CAPE HAT TERAS
CGC CHILULA
GROUP FT MACON
GT8001 007
(1272)
WX SVC "A"
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RADIO LINES
LOCAL LOOP
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STA CAPE CHARLES
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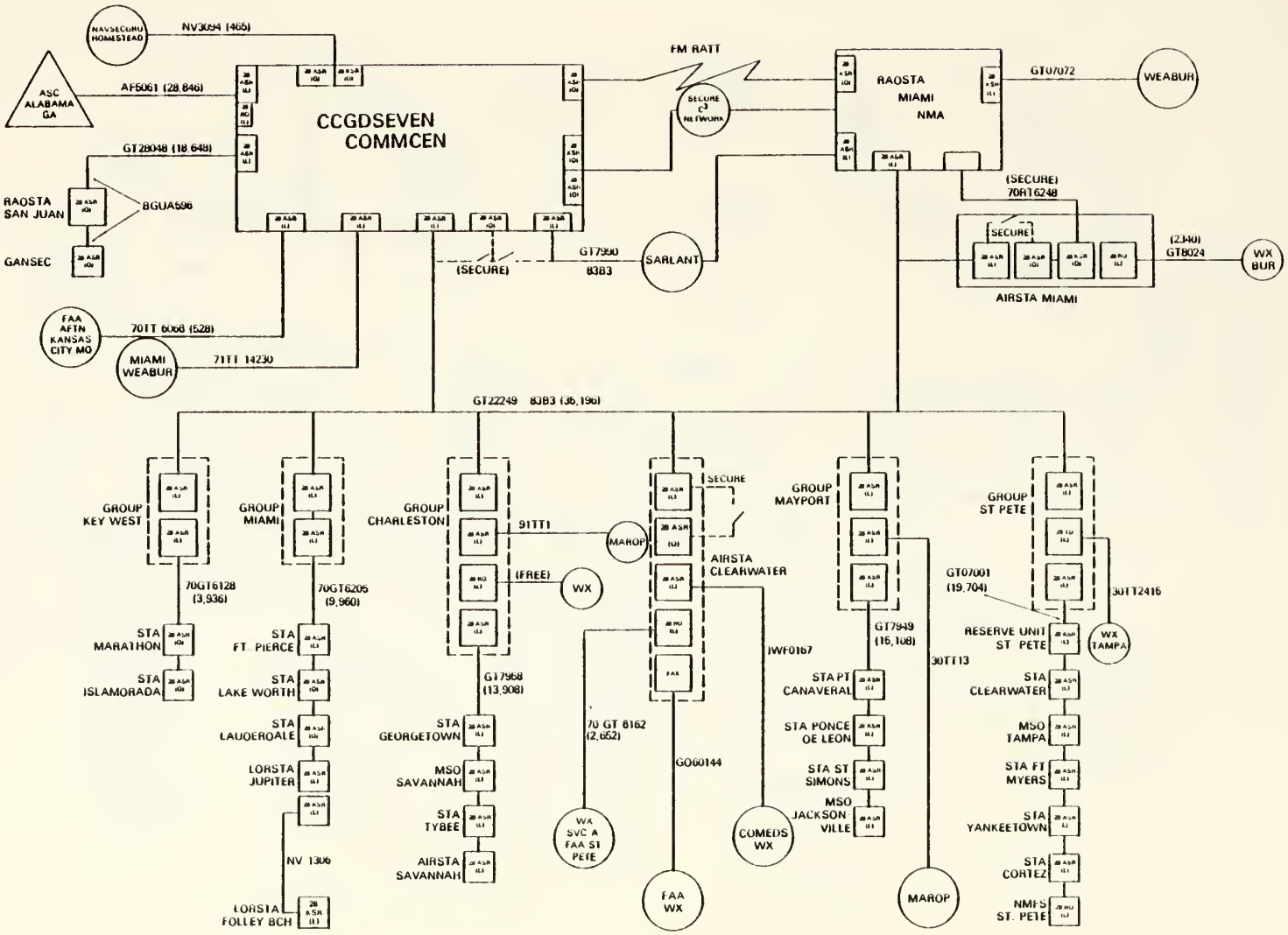
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STA ISLAMORADA
STA FT PIERCE
STA LAKE WORTH
STA LAUDERDALE
LORSTA JUPITER
NV 1306
LORSTA FOLLEY BCH
GT7968 (13,908)
STA GEORGETOWN
MSO SAVANNAH
STA TYBEE
AIRSTA SAVANNAH
70 GT 6162 (2,652)
WX SVC A FAA ST PETE
GO60144
FAA WX
IWF0167
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STA PONCE DE LEON
STA ST SIMONS
MSO JACKSONVILLE
COMEDS WX
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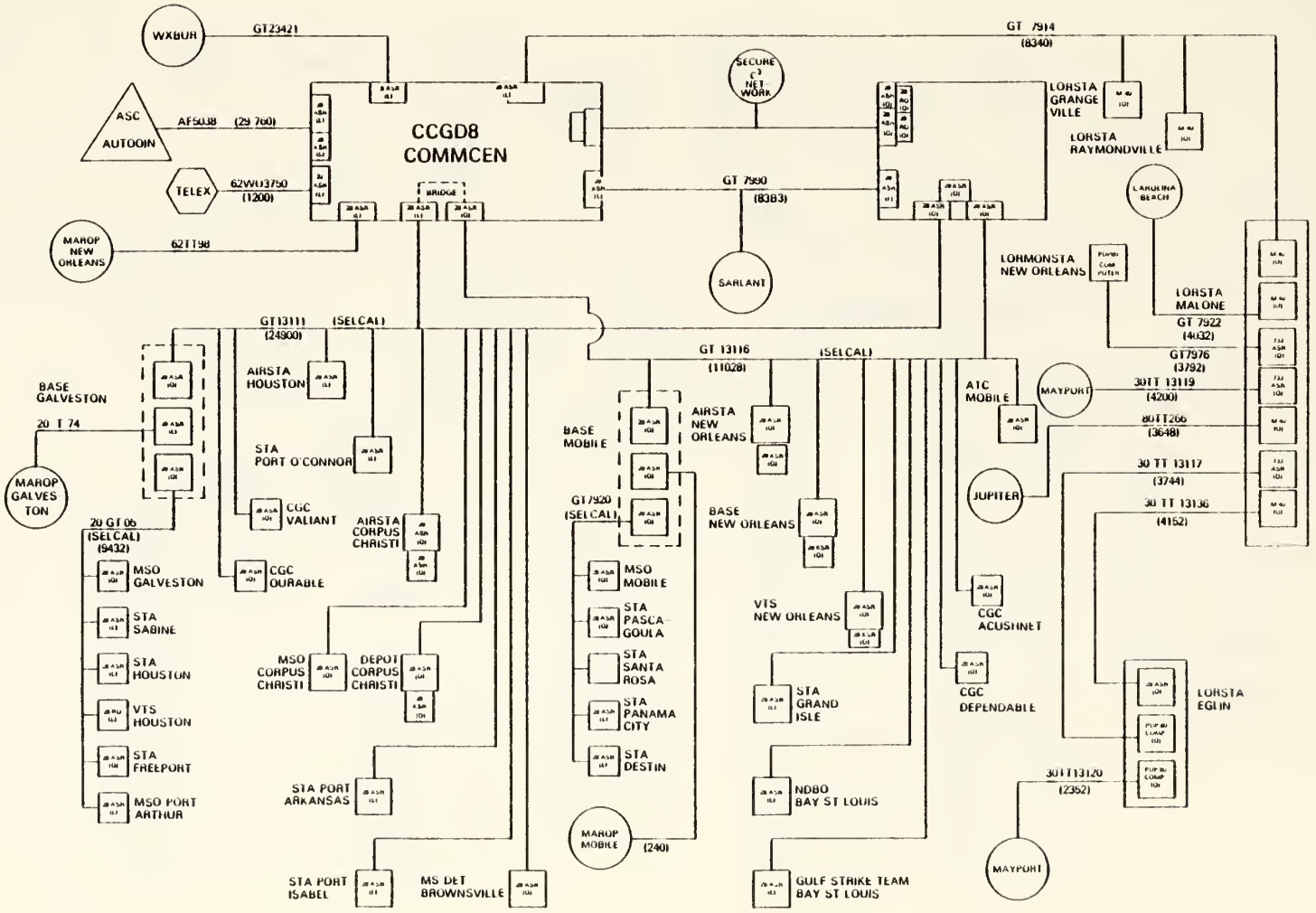
NMFS ST. PETE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(SELCAL)
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BASE GALVESTON
20 T 74
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BASE MOBILE
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ATC MOBILE
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(4200)
80TT266
(3648)
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(3744)
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(4152)
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20 GT 05
(SELCAL)
(9432)
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AIRSTA CORPUS CHRISTI
BASE NEW ORLEANS
MSO GALVESTON
CGC OURABLE
MSO MOBILE
VTS NEW ORLEANS
CGC ACUSHNET
STA SABINE
STA PASCA GOULA
STA HOUSTON
MSO CORPUS CHRISTI
DEPOT CORPUS CHRISTI
STA SANTA ROSA
STA GRAND ISLE
CGC DEPENDABLE
LORSTA EGLIN
VTS HOUSTON
STA PANAMA CITY
STA FREEPORT
STA DESTIN
NDBO BAY ST LOUIS
30TT13120
(2352)
MSO PORT ARTHUR
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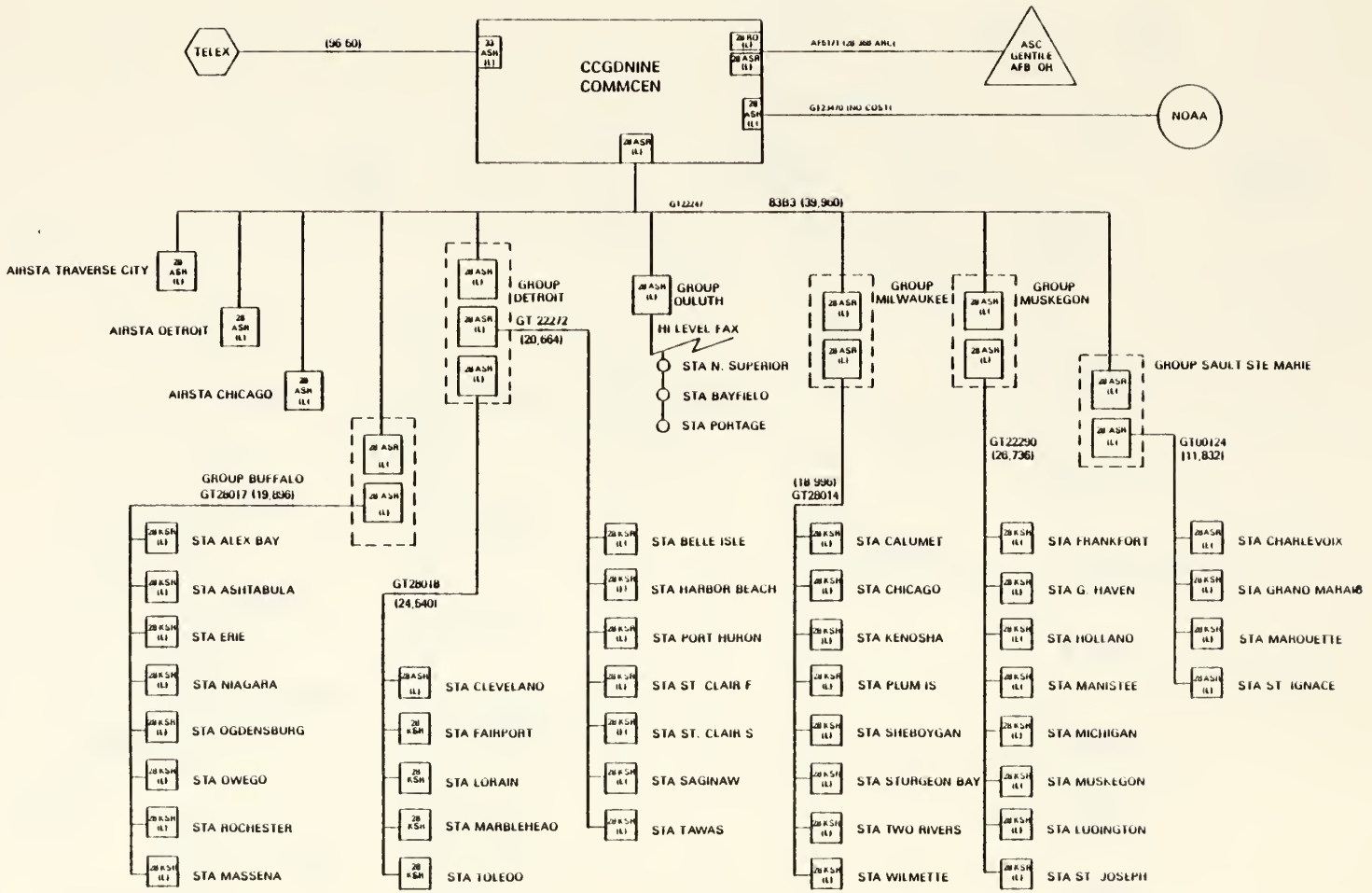
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AIRSTA CHICAGO
GROUP
DETROIT
GT 22272
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HI LEVEL FAX
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STA BAYFIELD
STA PORTAGE
GROUP
MILWAUKEE
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STA CLEVELAND
STA FAIRPORT
STA LORAIN
STA MARBLEHEAD
STA TOLEDO
STA BELLE ISLE
STA HARBOR BEACH
STA PORT HURON
STA ST CLAIR F
STA ST. CLAIR S
STA SAGINAW
STA TAWAS
STA CALUMET
STA CHICAGO
STA KENOSHA
STA PLUM IS
STA SHEBOYGAN
STA STURGEON BAY
STA TWO RIVERS
STA WILMETTE
STA FRANKFORT
STA G. HAVEN
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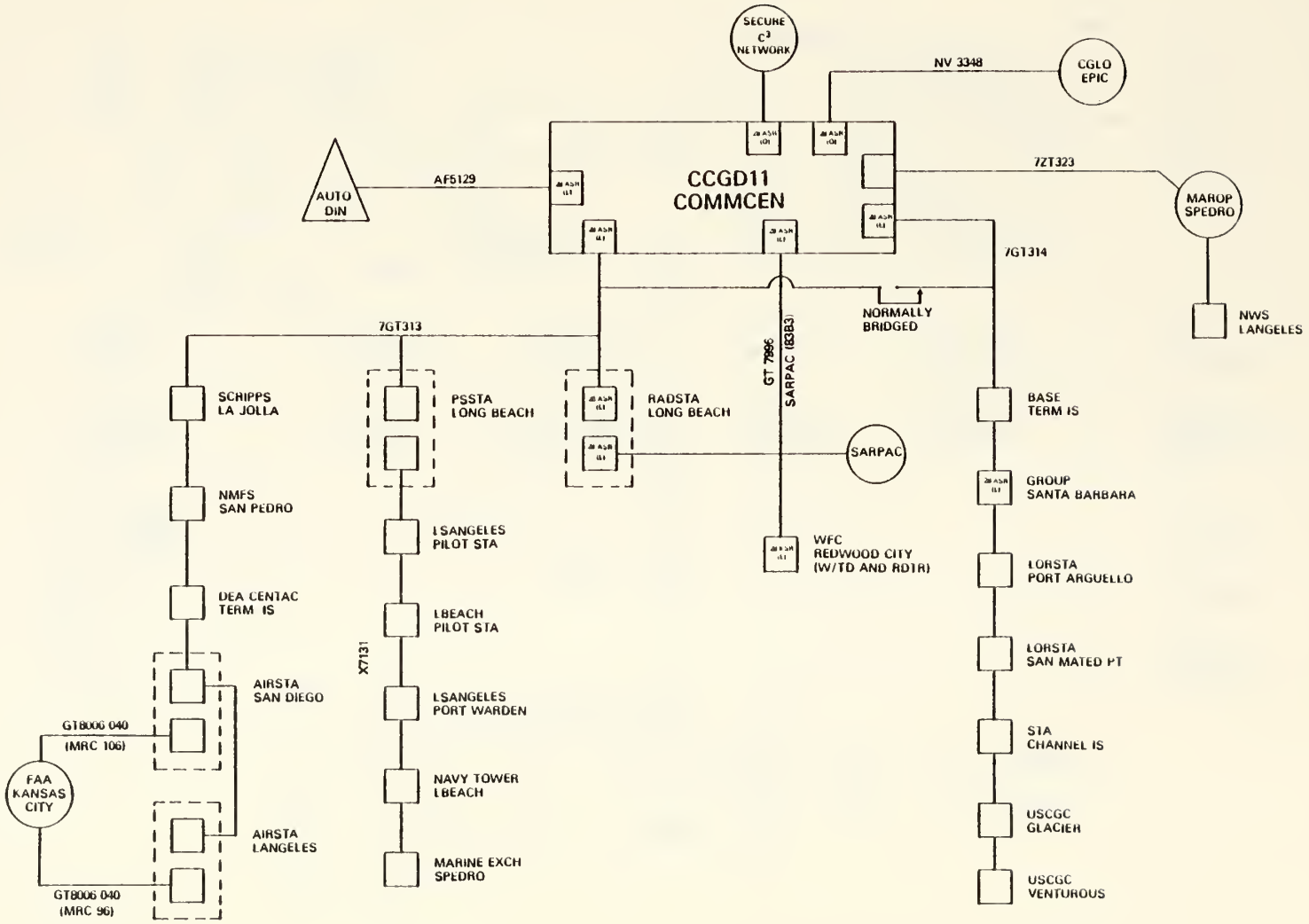
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NWS LANGELES
NORMALLY BRIDGED
7GT313
GT 7896
SARPAC (83B3)
SCRIPPS LA JOLLA
PSSTA LONG BEACH
RADSTA LONG BEACH
SARPAC
BASE TERM IS
NMFS SAN PEDRO
GROUP SANTA BARBARA
LSANGELES PILOT STA
WFC REDWOOD CITY (W/TD AND RDTR)
DEA CENTAC TERM IS
LORSTA PORT ARGUELLO
LBEACH PILOT STA
X7131
LORSTA SAN MATED PT
AIRSTA SAN DIEGO
LSANGELES PORT WARDEN
GT8006 040 (MRC 106)
STA CHANNEL IS
NAVY TOWER LBEACH
FAA KANSAS CITY
USCGC GLACIER
AIRSTA LANGELES
MARINE EXCH SPEDRO
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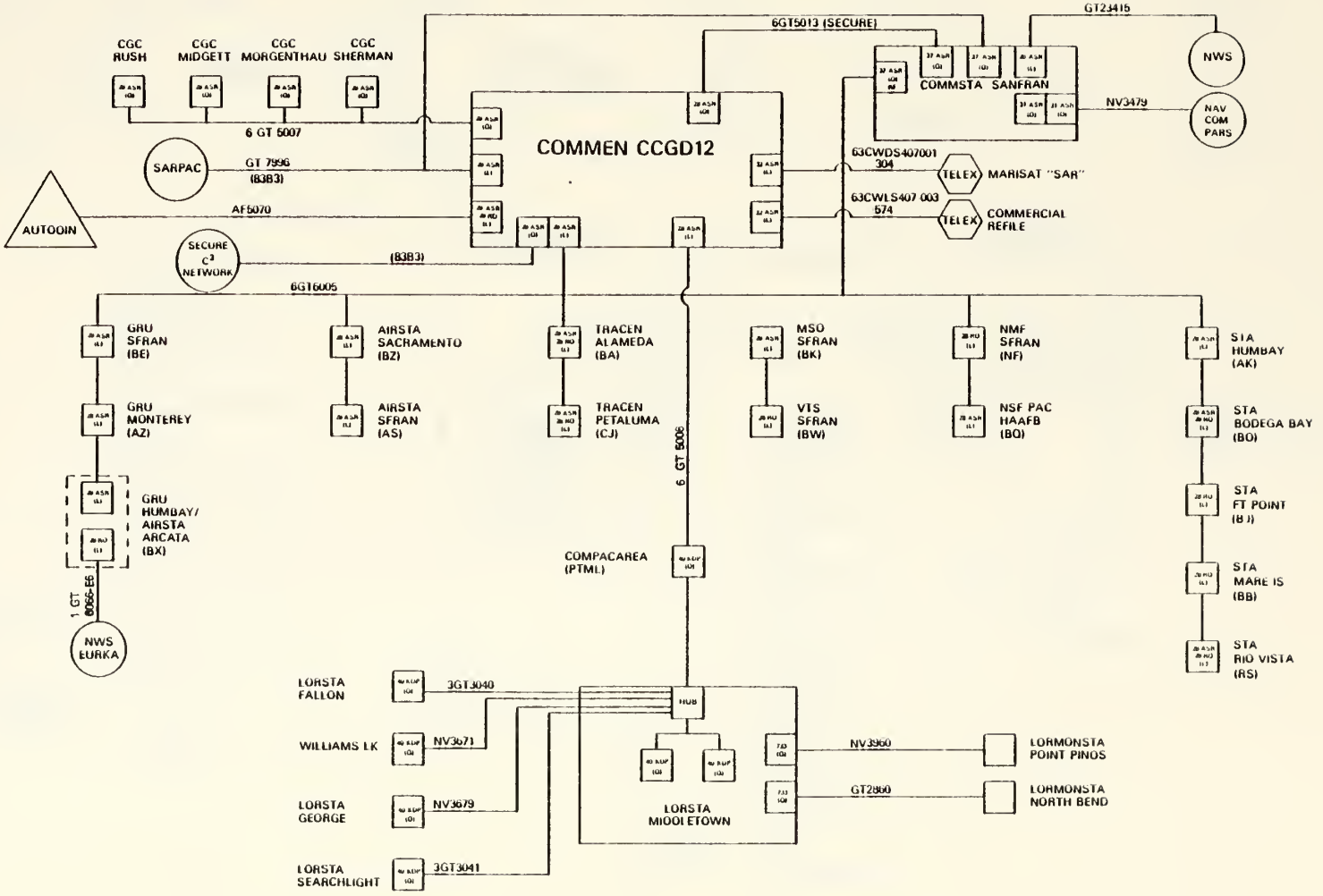
USCGC VENTUROUS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CGC MIDGETT
CGC MORGENTHAU
CGC SHERMAN
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SARPAC
GT 7996
(83B3)
AUTODIN
AF5070
SECURE C3 NETWORK
(83B3)
COMMEN CCGD12
6GT5013 (SECURE)
GT23415
NWS
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NV3479
NAV COM PARS
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TELEX
MARISAT "SAR"
63CWLS407 003 574
TELEX
COMMERCIAL REFILE
6GT6005
GRU SFRAN (BE)
GRU MONTEREY (AZ)
GRU HUMBAY/ AIRSTA ARCATA (BX)
1 GT 6066-E6
NWS EURKA
AIRSTA SACRAMENTO (BZ)
AIRSTA SFRAN (AS)
TRACEN ALAMEDA (BA)
TRACEN PETALUMA (CJ)
6 GT 5006
COMPACAREA (PTML)
MSO SFRAN (BK)
VTS SFRAN (BW)
NMF SFRAN (NF)
NSF PAC HAAFB (BQ)
STA HUMBAY (AK)
STA BODEGA BAY (BO)
STA FT POINT (BJ)
STA MARE IS (BB)
STA RIO VISTA (BS)
LORSTA FALLON
3GT3040
WILLIAMS LK
NV3671
LORSTA GEORGE
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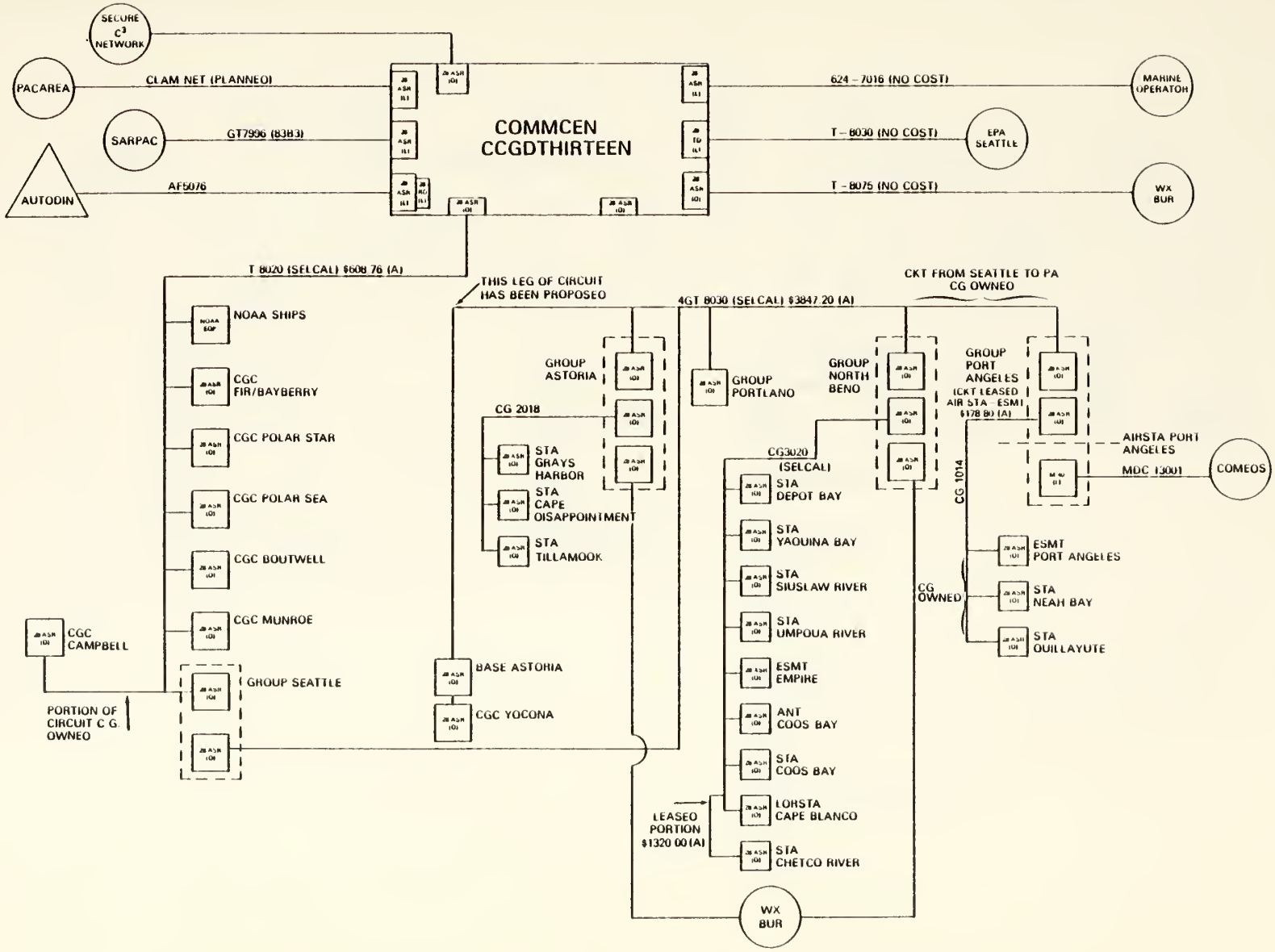
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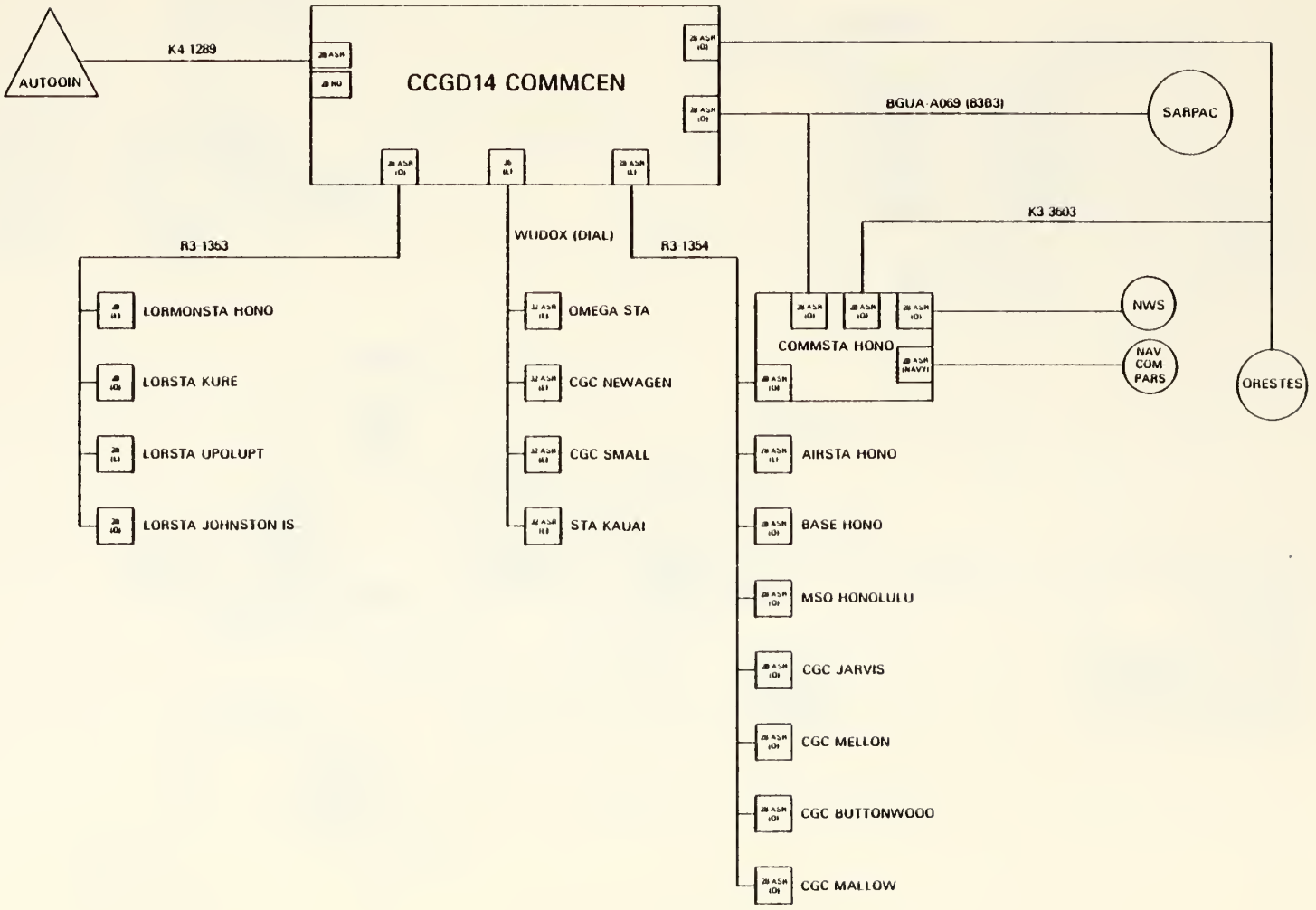
PACAREA
CLAM NET (PLANNED)
SARPAC
GT7996 (8383)
AUTODIN
AF5076
COMMCEN CCGDTHIRTEEN
624 - 7016 (NO COST)
MARINE OPERATOR
T - 8030 (NO COST)
EPA SEATTLE
T - 8075 (NO COST)
WX BUR
T 8020 (SELCAL) $608 76 (A)
THIS LEG OF CIRCUIT HAS BEEN PROPOSED
4GT 8030 (SELCAL) $3847 20 (A)
CKT FROM SEATTLE TO PA CG OWNED
NOAA SHIPS
CGC FIR/BAYBERRY
CGC POLAR STAR
CGC POLAR SEA
CGC BOUTWELL
CGC MUNROE
CGC CAMPBELL
GROUP SEATTLE
PORTION OF CIRCUIT C G. OWNED
GROUP ASTORIA
CG 2018
STA GRAYS HARBOR
STA CAPE DISAPPOINTMENT
STA TILLAMOOK
BASE ASTORIA
CGC YOCONA
GROUP PORTLAND
GROUP NORTH BEND
CG3020 (SELCAL)
STA DEPOT BAY
STA YAQUINA BAY
STA SIUSLAW RIVER
STA UMPQUA RIVER
ESMT EMPIRE
ANT COOS BAY
STA COOS BAY
LORSTA CAPE BLANCO
STA CHETCO RIVER
LEASED PORTION $1320 00 (A)
WX BUR
GROUP PORT ANGELES
(CKT LEASED AIR STA - ESMT $178 80 (A)
CG 1014
AIRSTA PORT ANGELES
MDC 13001
COMEOS
ESMT PORT ANGELES
STA NEAH BAY
STA QUILLAYUTE
CG OWNED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CCGD14 COMMCEN
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SARPAC
K3 3603
R3 1363
WUDOX (DIAL)
R3 1354
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LORSTA KURE
LORSTA UPOLUPT
LORSTA JOHNSTON IS
OMEGA STA
CGC NEWAGEN
CGC SMALL
STA KAUAI
COMMSTA HONO
NWS
NAV COM PARS
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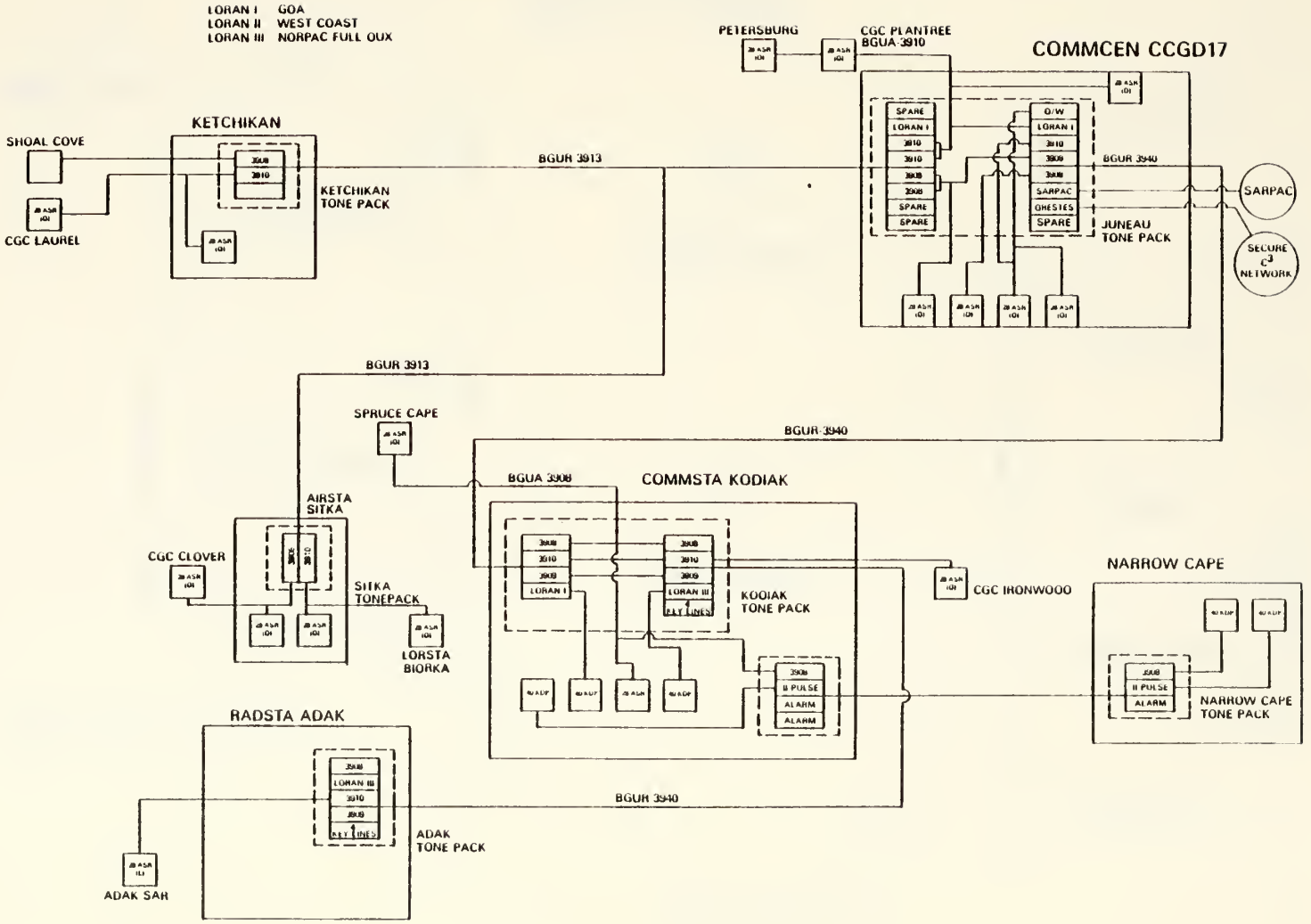
AIRSTA HONO
BASE HONO
MSO HONOLULU
CGC JARVIS
CGC MELLON
CGC BUTTONWOOD
CGC MALLOW


LORAN I GOA
LORAN II WEST COAST
LORAN III NORPAC FULL DUX
PETERSBURG
CGC PLANTREE
BGUA 3910
COMMCEN CCGD17
KETCHIKAN
SHOAL COVE
CGC LAUREL
KETCHIKAN
TONE PACK
BGUR 3913
SPARE
LORAN I
3910
3910
3909
3908
SPARE
SPARE
O/W
LORAN I
3910
3909
3908
SARPAC
ONESTES
SPARE
BGUR 3940
JUNEAU
TONE PACK
SARPAC
SECURE DJ NETWORK
BGUR 3913
SPRUCE CAPE
BGUR 3940
BGUA 3908
COMMSTA KODIAK
AIRSTA
SITKA
CGC CLOVER
SITKA
TONEPACK
LORSTA
BIORKA
3908
3910
3909
LORAN I
3908
3910
3909
LORAN III
KODIAK
TONE PACK
CGC IRONWOOD
NARROW CAPE
II PULSE
ALARM
ALARM
NARROW CAPE
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TONE PACK
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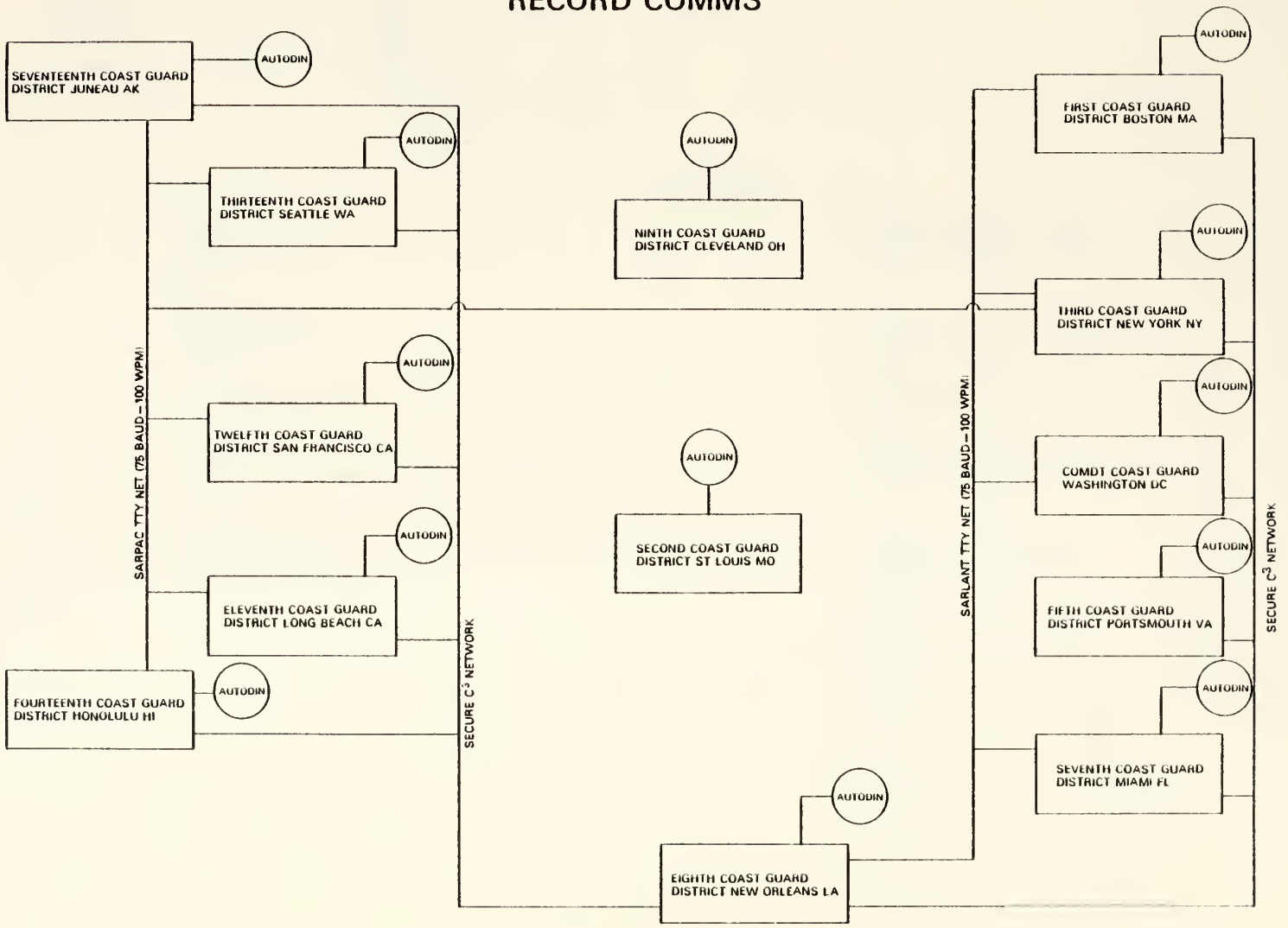
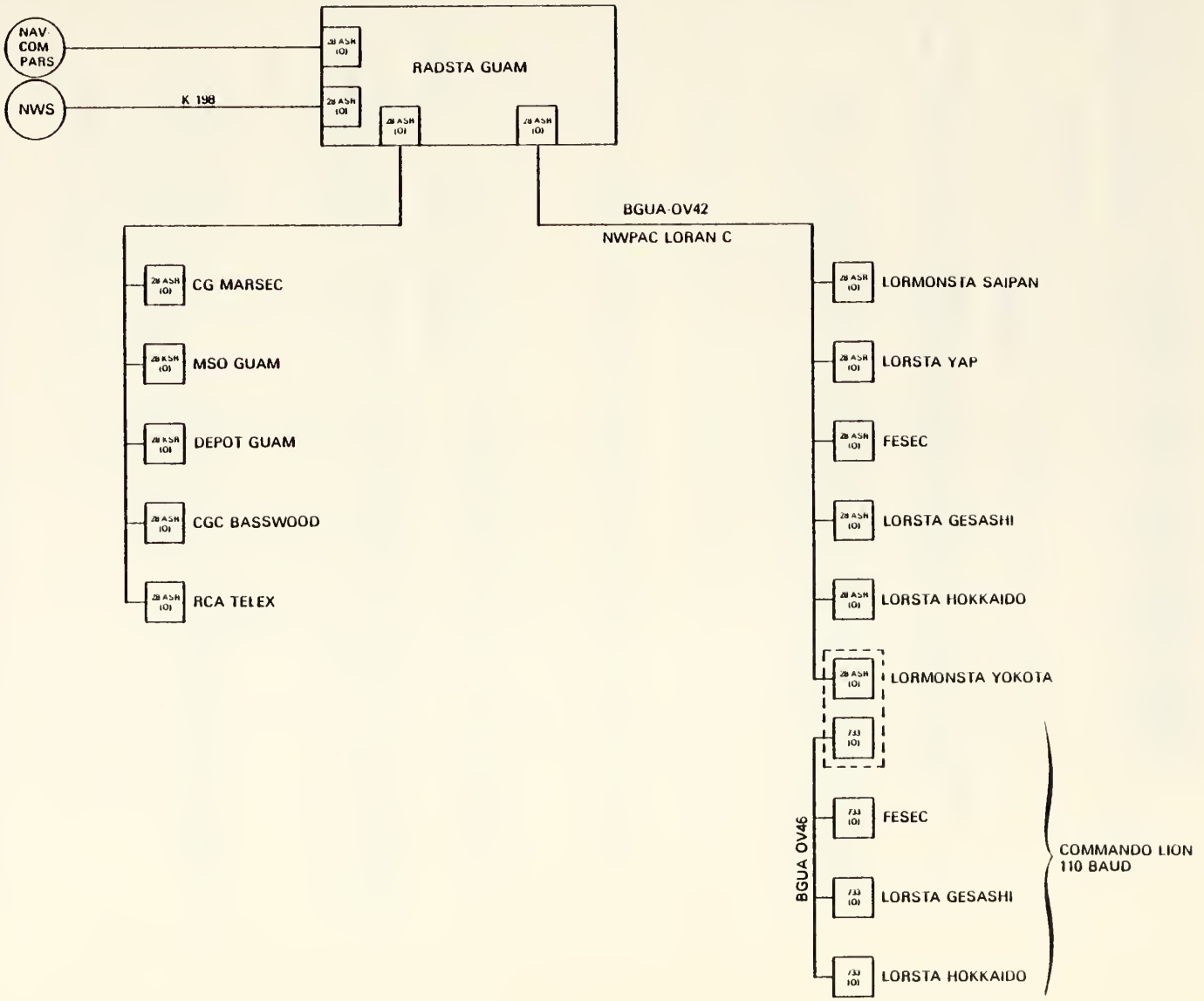
ADAK SAR

INTER-DISTRICT RECORD COMMS

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K 198
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CG MARSEC
MSO GUAM
DEPOT GUAM
CGC BASSWOOD
RCA TELEX
LORMONSTA SAIPAN
LORSTA YAP
FESEC
LORSTA GESASHI
LORSTA HOKKAIDO
LORMONSTA YOKOTA
BGUA OV46
FESEC
LORSTA GESASHI
LORSTA HOKKAIDO
COMMANDO LION
110 BAUD

LIST OF REFERENCES

1. GSA/ADTS Speech: "The Emerging Federal Market Place", Delivered 10 April 1979, Kansas City, Missouri.

2. Griesinger, Frank K., How to Cut Costs and Improve Service of Your Telephone, Telex, TWX, and Other Telecommunications, McGraw-Hill, New York, N.Y., 1974.

3. Op. Cit., Reference 1, p. 2.

4. Federal Property Management Regulations, TR-51.

5. Carr, Frank J., "Government Telecommunications Needs for Civilian Agencies", Telecommunications, June 1979, pp. 35-40.

6. Martin, James, Future Developments In Telecommunications, 2nd ed., Prentice-Hall, Inc., Englewood Cliffs, N.J., 1977.

7. OMB Bulletin No. 79-12 of 31 July 1979.

8. Ibid, p. 1.

9. United States Coast Guard Commandant Notice 2305, dated 9 July 1980.

10. Ibid, p. 1.

11. United States Coast Guard Commandant Instruction M2000.3, Telecommunications Manual.

12. United States Coast Guard Headquarters, Chief, Telecommunications Management Division Memo 2361, serial 745-2-G-OTM, dated 7 Sept 1979.

13. The Privacy Act of 1974, 5 U.S. Code 552a.

14. Frost and Sullivan, Inc., Telephone Accounting and Routing Systems (TARS) Market, a Private Report for the United States Coast Guard, dated July 1979.

15. GSA, FTS USERS GUIDE, July, 1979.

16. Ibid, p. 1.

17. Mead, R. R., LT, USCG, "Free Telephone Service???", Coast Guard Telecommunications Bulletin, Jan. 1979, pp. 31-32.

18. Martin, James, Introduction to Teleprocessing, Printice-Hall, Inc., Englewood Cliffs, N.J., 1972.

19. Cypser, R. J., Communications Architecture for Distributed Systems, Addison-Wesley, Reading, Massachusetts, 1978.

20. FCC Docket Number 18920.

21. Op. Cit., Reference 14, pp. 36-40.

22. Op. Cit., Reference 14, pp. 76-84.

23. Griesinger, Frank K., "WATS: How Much of a Bargin?", Administrative Management, August, 1976.

24. U.S. Army Headquarters, 7th Signal Command ACS for Plans and Operations, letter dated 3 July 1980.

25. Naval Environmental Prediction Research Facility Instruction 2300.2 dated 20 May 1977.

26. Op. Cit., Reference 23.

27. FCC Tariff Number 255.

28. Op. Cit., Reference, p. 31.

29. Griesinger, Frank K., "A Do-It-Yourself Program for Analyzing and Installing WATS", Business Communications Review, September-October, 1976, pp. 11-17.

30. Terrell, Russ, "Financial Management, A Communicators Responsibility", Coast Guard Telecommunications Bulletin, January 1979, pp. 11-13.

31. United States Coast Guard Support Center Seattle, Wash., Commanding Officers Rapidraft dated 2 September 1980.

32. Op. Cit., Reference 7, p. 1.

33. Op. Cit., Reference 2, p. 282.

34. Op. Cit., Reference 6, p. 271.

35. Op. Cit., Reference 6, p. 274.

36. Griesinger, Frank K., "New PABX Systems", Administrative Management, November, 1976, pp. 35-39.

37. Mayo, Richard Walter, and Wittman, William Warren, The Structure, and Conduct, and Performance of the United States Telecommunications Industry, unpublished thesis for Master of Science, NPS, Monterey, CA, March, 1977.

38. Brooks, John, Telephone, The First Hundred Years, Harper and Row, New York, N.Y., 1975.

39. Ibid, p. 23.

40. Op. Cit., Reference 14, p. 38.

41. Op. Cit., Reference 14, p. 39.

42. Op. Cit., Reference 6, p. 3.

43. Op. Cit., Reference 6, p. 6.

44. Martin, James, The Wired Society, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1978.

45. Higman, Howard, "The Information Society", Telecommunications: An Interdisciplinary Survey, L. Lewin, editor, Artech House, 1979.

46. Op. Cit., Reference 1, p. 1.

47. Op. Cit., Reference 9, p. 2.

BIBLIOGRAPHY

BOOKS

Beckman, Peter, Elementary Queueing Theory, The Golem Press, 1968.

Bonbright, James C., Principles of Public Utility Rates, Columbia University Press, 1966.

Brackett, Gilbert R., Telephone Traffic Engineering Handbook, Telephony Publishing Company, 1972.

Costigan, Daniel M., FAX: The Principles and Practice of Fascimile Communications, Chilton Book Company, 1970.

Davenport, William, Modern Data Communications, Hayden Publishing Company, 1971.

Dexter, Wallace G., Right Number Wrong Price, Vantage Press, New York, N.Y.

Garfield, Paul, and Lovejoy, W., Public Utility Economics, Prentice-Hall, Inc., 1964.

Genthe, Edgar C. Jr., Data Communications in Business, AT&T Company, New York, N.Y., 1965.

Griesinger, Frank K., How to Cut Costs and Improve Service of Your Telephone, Telx, TWX, and Other Telecommunications, McGraw-Hill Book Company, 1974.

Head, Robert V., Real Time Business Systems, Holt, Rinehart and Winston, Inc., 1964.

Henkel, George, Telephony for the Sound Contractor, Sound Publishing Company, 1972.

Hobbs, Marvin, Modern Communications Switching Systems, Tab Books, Blue Ridge Summit, Pennsylvania 17214, 1974.

Kou, Abramson, (Ed.), Computer Communications Network, Prentice-Hall, Inc., 1973.

Kuehn, Richard A., Controlling Telephone Costs, American Management Associations, 1974.

Kuehn, Richard A., Cost Effective Telecommunications, American Management Associations, 1974.

Kuehn, Richard A., Interconnection, How? Why?, American Management Associations, 1975.

Lee, Frank, ABC of the Telephone, Telephony Publishing Company, 4 volumes.

Martin, James, Future Developments in Telecommunications, Prentice-Hall, Inc., 1971.

Martin, James, Systems Analysis for Data Transmission, Prentice-Hall, Inc., 1972.

Martin, James, Telecommunications and the Computer, Prentice-Hall, Inc., 1969.

Martin, James, Teleprocessing Network Organization, Prentice-Hall, Inc., 1970.

Mathison, S. L., and Walter, P. M., Computers and Telecommunications: Issues in Public Policy, Prentice-Hall, Inc., Englewood Cliffs, N.J., 1970.

National Association of Regulatory Utility Commissioners, Public Utility Depreciation Practices, 1968.

Nichols and Welch, Ruling Principles of Utility Regulation, Public Utility Reports, 1955.

Panter, Philip F., Communications System Design, McGraw-Hill Book Company, 1972.

Priest, A.J.G., Principles of Public Utility Regulation, The Michie Company, 1969.

Smith, Emerson G., Glossary of Communications, Telephony Publishing Company, 1971.

Stone, Roy, Cost Reduction in Wire Communications, Christopher Publishing House, 1959.

Trebing, Harry M., Essays on Public Utility Pricing and Regulation, Michigan State Graduate School of Business, 1971.

Vilips, Vess V., Data Modem Guide, Artech House, 1972.

Yourdon, Edward, Design of On-Line Computer Systems, Prentice-Hall, Inc., 1972.

MAGAZINES

Administrative Management, New York, N.Y. 10010, Geyer-McAllister Publications, Inc.

Bell Laboratories Record, Bell Telephone Laboratories, Inc., 600 Mountain Ave., Murray Hill, N.J. 07974.

Business Communications Review, 800 Enterprise Drive, Oak Brook, Illinois 60521. Bi-monthly.

Canadian Interconnection, Tele-Connect Publications, 150 Metcalf Street, Ottawa, Ontario K2P1P1. Monthly.

Communication Engineer and Management, Telephony Publishing Corporation, 1900 West Yale, Englewood, Colorado. Monthly, controlled circulation.

Communications News, Communications News Publishing Company, 402 West Liberty Drive, Wheaton, Illinois. Monthly.

Communications User, The, Communications Trends, Inc., 181 S. Franklin Ave., Valley Stream, N.Y. 11581.

Computer Decisions, Hayden Publishing Company, 50 Essex St., Rochelle Park, N.J. 07662. Monthly, controlled circulation.

Computerworld, 797 Washington Street, Newton, Massachusetts 02160. Weekly.

Data Communications User, Communication Trends, Inc., 181 South Franklin Avenue, Valley Stream, N.Y. 11581. Monthly, controlled circulation.

Data Dynamics, North American Publishing Co., 134-13th Street, Philadelphia, Pa. 19107.

Datamation, Technical Publishing Company, 1301 South Grove Avenue, Barrington, Illinois 60010. Monthly, controlled circulation.

Electronics, McGraw-Hill Publishing Company, 1221 Avenue of the Americas, New York, N.Y. 10020. Bi-weekly.

I/C Communications, P.O. Box 62, East White Plains, N.Y. 10604. Monthly.

Infosystems, Hitchcock Publishing Company, Hitchcock Building, Wheaton, Illinois 60187. Monthly, controlled circulation.

Interconnection, 37 West 57th Street, New York, N.Y. 10019. Monthly.

Microwave Systems News, Weber Publications Inc., 3921 East Bayshore Road, Palo Alto, CA 94303. Bi-monthly, controlled circulation.

Microwaves, Hayden Publications Inc., 50 Essex Street, Rochelle Park, N.J. 07662. Monthly, controlled circulation.

Modern Data, Modern Data Services Inc., 3 Lockland Avenue, Farmingham, Mass. 01701. Monthly, controlled circulation.

Public Utilities Fortnightly, Public Utility Reports, Inc., 1828 L Street, N.W., Washington, D.C. 20036. Every 20 days.

Sound and Communications, Sound Publishing Company, 150 East 37th Street, New York, N.Y. 10016. Monthly.

Telecommunications, 610 Washington Street, Dedham, Mass. 02026. Monthly, controlled circulation.

Telecommunications Product Review, P. O. Box 217, Gaithersburg, Maryland 20760. Monthly.

Telephone Engineer and Management, 402 West Liberty Drive, Wheator, Illinois 60187. Bi-monthly.

Telephone Interconnect Journal, Communications Publishing Corporation, 1900 West Yale, Englewood, Colorado 80110. Monthly, controlled circulation.

Telephony, Telephony Publishing Company, 53 West Jackson Blvd., Chicago, Illinois 60604. Weekly.

REFERENCE SERVICE

Auerbach Computer Technology Reports, Auerbach Publishers, Philadelphia, Pennsylvania. Monthly.

Exchange Service Telephone Rates, National Association of Regulatory Utility Commissioners, P.O. Box 684, Washington, D.C. 20044.

The Guide to Communication Services, Center for Communications Management, Inc., P.O. Box 324, Ramsey, N.J. 07446.

Long Distance Message Toll Rates, National Association of Regulatory Utility Commissioners, P. O. Box 684, Washington, D.C. 20044

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